



Citation for published version:

Alsop, G, Tompsett, C & Wisdom, J 1997, *A Study of Human Communication Issues In Interactive Scholarly Electronic Journals: eLib Supporting Study*. UKOLN, University of Bath, Bath.

Publication date:
1997

Document Version
Publisher's PDF, also known as Version of record

[Link to publication](#)

University of Bath

Alternative formats

If you require this document in an alternative format, please contact:
openaccess@bath.ac.uk

General rights

Copyright and moral rights for the publications made accessible in the public portal are retained by the authors and/or other copyright owners and it is a condition of accessing publications that users recognise and abide by the legal requirements associated with these rights.

Take down policy

If you believe that this document breaches copyright please contact us providing details, and we will remove access to the work immediately and investigate your claim.

LONDON GUILDHALL UNIVERSITY
EDUCATIONAL AND STAFF DEVELOPMENT

KINGSTON UNIVERSITY
SCHOOL OF INFORMATION SYSTEMS
LIBRARY AND MEDIA SERVICES

**A Study Of Human Communication Issues In Interactive
Scholarly Electronic Journals:
eLib Supporting Study**

Final Report

By

Graham Alsop (London Guildhall University)

Chris Tompsett (Kingston University)

James Wisdom (London Guildhall University)



**LONDON GUILDHALL
UNIVERSITY**



Acknowledgements

The project team wish to acknowledge the assistance and expertise of Bill Downey, Darryl Kirk and Nik Pollard in Library and Media Services at Kingston University for their help in completing this work. We would also like to thank the project teams of CLIC, Formations and JILT for their willingness and enthusiasm to participate in the study. Their hospitality was also appreciated. Finally, we are grateful to all colleagues who attended our consultation meetings.

EXECUTIVE SUMMARY	3
MAIN FINDINGS AND RECOMMENDATIONS	4
FINDINGS.....	4
RECOMMENDATIONS	5
1. INTRODUCTION TO THE REPORT.....	6
2. DISCUSSION	7
2.1. DISCIPLINARY DIFFERENCES	7
2.2. THE ESTABLISHMENT OF THRIVING ELECTRONIC COMMUNITIES.....	8
2.3. HINDRANCES TO ELECTRONIC COMMUNITY BUILDING	9
2.4. IT AND CORE ACADEMIC ACTIVITY	10
2.5. CHANGING ASSUMPTIONS:.....	11
2.5.1. <i>Assessment of Quality</i>	11
2.5.2. <i>About Relationships</i>	12
2.5.3. <i>About the Ownership of Knowledge</i>	13
3. INTRODUCTION TO THE STUDIES	15
3.1. ABOUT LANGUAGE	15
3.2. CHANGE MANAGEMENT AND COMPUTER INTERFACE DESIGN	15
4. THE CASE STUDIES	16
4.1. INTRODUCTION	16
4.2. THE CASE STUDIES SUMMARY	16
4.3. KEY POINTS FROM JILT	17
4.4. KEY POINTS FROM CLIC.....	18
4.5. KEY POINTS FROM FORMATIONS.....	19
5. THE CONSULTATION EXERCISE	20
5.1. INTRODUCTION	20
5.2. THE CONSULTATION EXERCISE SUMMARY.....	20
5.3. KEY POINTS FROM LAWYERS.....	21
5.4. KEY POINTS FROM CHEMISTS	22
5.5. KEY POINTS FROM CULTURAL STUDIES.....	22
6. LITERATURE REVIEW	23
6.1. METHOD.....	23
6.1.1. <i>Introduction and Exclusions</i>	23
6.1.2. <i>Method</i>	24
6.2. OVERVIEW OF MAIN MODELS	24
6.2.1. <i>Terminology</i>	24
6.3. SPECIFIC TOPICS.....	25
6.3.1. <i>The differences between disciplines</i>	26
6.3.2. <i>The Ways In Which Communication Contributes To The Creation Of Knowledge</i>	30
6.3.3. <i>Reviewing of Resources [Ginsparg 1996]</i>	32
6.3.4. <i>Accessing Resources [Atkinson 1996]</i>	33
6.3.5. <i>Evolutionary and Radical Change</i>	34

7. APPENDICES	37
7.1. FIELD REPORTS FOR CASE STUDIES	37
7.1.1. <i>JILT</i>	37
7.1.2. <i>CLIC</i>	41
7.1.3. <i>Formations</i>	45
7.2. FIELD REPORTS FOR CONSULTATION	48
7.2.1. <i>Lawyers</i>	48
7.2.2. <i>Chemists</i>	51
7.2.3. <i>Cultural Studies</i>	56
7.3. BIBLIOGRAPHY	60
7.3.1. <i>Bibliography of Articles Read</i>	60
7.3.2 <i>Extended Bibliography</i>	65
7.3.3 <i>Bibliographic References for Indirect Citations</i>	69

EXECUTIVE SUMMARY

This project, conducted between March and July 1997, has explored the changes that are taking place to scholarly communication as it moves into the electronic domain. Evidence has been collected from three studies:

- a case study review of three Elib projects chosen to cover a broad set of disciplines. The projects selected were:
 - The CLIC Consortium - Chemical Communications
 - The Journal of Information Law and Technology (JILT)
 - Formations -a pre-print database in cultural policy, media studies and performance theory.
- a consultation exercise with potential users of such services, with activists from the same three disciplines, and
- a literature review, with an international basis, to gain a greater understanding of the emotional, cognitive and socio-psychological issues surrounding interactivity in electronic scholarly communication.

On the basis of the evidence collected and the literature reviewed, the team have taken a number of issues which we wish to highlight as being of particular importance to the Electronic Libraries community in promoting the use of electronic resources or planning future activities.

- The first is that there is significant range of difference between access to and use of electronic communication in the discipline areas, which is closely related to the nature of the disciplines.
- The second is that some key characteristics define how a discipline does and can develop into a thriving electronic community.
- The third is that further characteristics might hold it back from developing into such a community.
- The fourth is that the extent to which information technology is exploited as a core academic activity is a significant indicator for the uptake of electronic communications.

Further, the development of scholarly electronic communication has led to changes in many of the assumptions which have hitherto driven parts of the academic world. We have chosen to highlight changes which we think are of particular importance to :

- the assessment of quality;
- to ways of forming relationships;
- to the use of language and to the ownership of knowledge.

MAIN FINDINGS AND RECOMMENDATIONS

FINDINGS

- 1: Although differences in communication patterns can be clearly seen at the discipline level, features at the sub-discipline level, based on stages or processes of research should be considered.
- 2: Thriving electronic communities develop from existing communities.
- 3: Sound information technology skills and support is necessary to exploit current software.
- 4: Higher levels of technical skill within a community supports challenge to assumptions to traditional methods of working from within a discipline.
- 5: In disciplines with lower levels of skill, developments are more focused on the use of electronic communication, rather than the benefits.
- 6: Lack of appropriate reward for electronic scholarly communication is a significant barrier to the development of electronic research communities.
- 7: Current approaches to the evaluation of journals may have an in-built inertia, particularly through citation approaches.
- 8: Lack of consistent technical support and provision can limit the spread of technological communities in some disciplines.
- 9: The requirement to use key software and resources in the process of research is characteristic of the research communities that exploit electronic communities.
- 10: Where the complexity of information that can be communicated, or the speed at which it can be exploited, has increased, evolution in the process of research can occur.
- 11: The availability of commercial quality specialist software at educationally affordable cost, can act as an important catalyst to scholarly communication at the sub-discipline level.
- 12: The assessment of quality management of journal and conference contributions, currently maintained through the process of refereeing, should be reviewed to consider the potential of assessing the quality of other forms of electronic communications.
- 13: The current technical support for electronic newsgroups, and the social constructs that are currently recreated through them, provide only limited support to establish group cohesiveness without additional opportunities to define group identity.
- 14: The most interesting approaches to scholarly communication are in areas which challenge the traditional model of individual research achievement and the reward for the ownership of such research.

- 15: New electronic journals are most likely to alter the nature of research when based on an existing readership and offering an evolutionary change in the method of research.
- 16: Attempts to produce radical change in the approach to research, and recognition of contribution to research, can expect to meet resistance in well organised, international disciplines.

RECOMMENDATIONS

- 1: That any future Research Assessment Exercise should use definitions of quality for scholarly communications that are independent of whether the publication mechanism is paper or electronically based.
- 2: The support for the development of new electronic journals should give careful consideration to the justification as to when, and for what reasons, such a journal will be considered a viable publication route by researchers in the discipline.
- 3: Research should be undertaken to explore the potential to capture and structure meta-information about the qualities of a scholarly contribution, of any type, and to include such meta-information in indexing services.
- 4: The potential to replace commercial, on-line services through the integration of less expensive services, should be explored where the cost of commercial services is considered to limit scholarly research.

1. INTRODUCTION TO THE REPORT

Following this introduction, the key issues identified in the 'Main Findings and Recommendations' are discussed and elaborated in Section 2, with references forward to the supporting studies where appropriate. Background issues to the report itself are considered in Section 3. The remaining sections cover each of the case studies in a sequence similar to that in which the project was conducted.

The project team decided it was important to approach the case studies with an open mind and therefore the Elib case studies is presented in Section 4. The consultation exercise follows on logically from this and is presented in Section 5. Both these sections are presented hierarchically and sections in boxes can be seen as providing specific detail about each subject area, rather than comparative discussion.

The literature review, including specific references is included as Section 6. Section 7 forms the Appendices, including field study reports and additional bibliographic information.

2. DISCUSSION

Without wishing to provide a specific definition, it is important to the project that we have viewed scholarly communication, as serving three functions within the academic community. These are the dissemination of new knowledge; the support for a reward system for academic researchers; and establishment of a resource system for educating new researchers. Inherent in this is traditional publishing world of scholarly, printed journals reflecting contributions at different levels of scholarly significance, where the journal (or series) in which an contribution is published is the indicator of quality.

A simple, information technology model approach to scholarly communication might suggest that, the traditional 'broadcast' model of publication (reporting in publications that are available to all) could be repeated, but with faster and wider access, through electronic communication . In addition, electronic communications might also support more interactive working - in the areas of collaborative working - drafting, editing and peer review before publication, and in the areas of discussion, commentary and embellishment after publication.

This could then offer the opportunity for electronic (virtual) forms of other activities, such as workshops, seminars or conferences, emerging as the opportunities of electronic communication re-model the traditions of all forms of scholarly communication, as e-mail has replaced telephone conversations for some scholars.

It is clear that electronic scholarly communication has led, in a limited number of cases, to such changes and, in certain cases has allowed more fundamental assumptions about the nature of how individuals and groups advance knowledge in their discipline rather than the patterns of how research is generated. Yet these changes have not been repeated universally.

This study has set out to consider factors and dynamics which might affect the acceptability of electronic communication. As a result of the study, some key characteristics, have been identified, beyond mere technical provision or capability, which will affect the nature, direction and speed of such developments and the scope for promoting such changes in the future.

These characteristics, as highlighted in the key findings, are elaborated below:

- disciplinary differences (Section 2.1)
- the nature of thriving electronic communities (Section 2.2)
- hindrances to electronic community building (Section 2.3)
- information technology and core academic activity (Section 2.4)

Section 2.5 includes a more detailed discussion of the areas in which fundamental assumptions may be changed:

- the assessment of quality;
- the ways of forming relationships and
- the ownership of knowledge.

2.1. DISCIPLINARY DIFFERENCES

This section outlines those factors that will influence the basic patterns of scholarly communication within a discipline or sub-discipline.

It is a truism that different disciplines create and represent knowledge in different ways and that the communication of ideas and thought will reflect this. Broad groupings of disciplines will reflect such common features. For example, disciplines differ in such features as the significance of primary and secondary sources, the length of time during which a scholarly publication may remain relevant before being superseded by a more recent one and the degree of validity attached to a refereed communication.

Most disciplines are actively engaged within national and international communities, but some nascent disciplines are too small to support national communities. Other disciplines are restricted in the number of issues that can be discussed at international level.

Disciplines differ in the relationship between the nature of leading edge academic research and leading edge professional and commercial work (where this exists). This difference is matched between the academic and commercial reward systems. This can influence the content of what can be communicated if commercial benefit is more rewarding than academic status, or can direct the education of potential researchers to professional practice rather than academic research.

Such general considerations must be tempered with recognition that the size of the communities that communicate at each stage of research, from initiating research to reviewing or reinterpreting the results, identifies different groups with varied purposes and communication patterns. These change with the progress of the research. Taken at this more detailed level of analysis, there are similarities between disciplines with different research patterns and differences between those that might be the same. This indicates that some interventions should be planned at the sub-discipline level.

Finding 1: Although differences in communication patterns can be clearly seen at the discipline level, features at the sub-discipline level, based on stages or processes of research should be considered.

2.2. THE ESTABLISHMENT OF THRIVING ELECTRONIC COMMUNITIES

Self-evident characteristics of successful development of electronically connected communities are:

- a community of colleagues who have built extensive communications into their working practice,
- a sound base of common information technology skills such that any new technical skills can be acquired,
- benefits which result through conversion from the existing form of communication to electronic

Finding 2: Thriving electronic communities develop from existing communities.

In such situations the successful communities are able to use information systems to gain synergy between different aspects of their research. In many cases this is effected through the commonality afforded through the world wide web, increasingly allowing more complex information to be passed as it moves electronic communications transfers from text to object-based communications. Further there is evidence that where such communities have been created, due recognition is given to their contributions.

Finding 3: Sound information technology skills and support is necessary to exploit current software.

Currently well developed disciplines are based on a thriving, department or school-based community. These communities are able to use the technology, foster the development of skills of new members and provide an infrastructure of reliable equipment and support. Such communities typically use specialist software and data in their own research (see Section 2.4), have learnt the necessary technical skills within their educational development, either formally, or through skills transfer from experienced practitioners. These groups are in a position to reassess the assumptions underlying research in their field within the context of the new patterns of communication that are now supported.

Finding 4: Higher levels of technical skill within a community supports challenge to assumptions to traditional methods of working from within a discipline.

With less well developed disciplines, there was a significant difference between the mature e-mail user and those who survive with minimum knowledge and skill. Advocates will often be individuals who are proactive in the use of information technology within all aspects of teaching and research in their departments or schools but who gain support through ad-hoc newsgroups. In such cases, work is more likely to be focused on the potential for electronic scholarly communication than its practice. It is possible that progress in developing a thriving electronic community is in the hands of the advocates, even if they are not aware of the significance of their position. Advances from scholarly communication in such disciplines will arise in those aspects of the discipline in which these practitioners are most active.

Finding 5: In disciplines with lower levels of skill, developments are more focused on the use of electronic communication, rather than the benefits.

2.3. HINDRANCES TO ELECTRONIC COMMUNITY BUILDING

It is undoubtedly the perception of most of the academic staff who participated in this consultation exercises that there was little point in investing too much time and effort in building a thriving research culture based on open electronic communication unless this was appropriately rewarded.

Finding 6: Lack of appropriate reward for electronic scholarly communication is a significant barrier to the development of electronic research communities.

A particular concern was the perception that there was no possible way that any of their work could be sufficiently or accurately valued for any research assessment exercise (Sections 4.2, 5.2).

Recommendation 1: That any future Research Assessment Exercise should use definitions of quality for scholarly communications that are independent of whether the publication mechanism is paper or electronically based.

Within the case studies, even those who were replicating models of paper-publishing value systems were sceptical that electronic communications, or electronic publishing would be awarded equal credit to ink-printed data. Two factors were suggested - that it takes time to

establish the credibility of particular publishing vehicles, and that peer review has a bias against novelty.

Finding 7: Current approaches to evaluation of journals may have an in-built inertia, particularly through citation approaches.

Recommendation 2: The support for the development of new electronic journals should give careful consideration to the justification as to when, and for what reasons, such a journal will be considered a viable publication route by researchers in the discipline.

The second major hindrance is the slowness of establishing a reliable infrastructure for communications. This is seen as a networked computer on every desk with suitable, windows-based software and reliable internet connectivity.

The lack of timely advice, training, or support are also barriers to developing basic electronic communication skills within an institution. Even where windows-based e-mail packages has made a significant difference to diminishing the number of obstacles, poor institutional support has been known to smother latent enthusiasm.

Finding 8: Lack of consistent technical support and provision can limit the spread of technological communities in some disciplines.

2.4. IT AND CORE ACADEMIC ACTIVITY

Section 2.2 identified the use of specialist software and data in research as a key characteristic of the thriving communities. This aspect is considered in more detail in this section.

The importance to research of specialist software for data handling, image manipulation or modelling was characteristic of successful electronic communities. There is evidence that discipline-enhancing software is specific at the sub-discipline level. In addition to more general desktop software and communication software, key information systems used included access to resources on a scale not achievable without software support, and the use of research tools, such as on-line indexes, citation indices and download-able publications.

Finding 9: The requirement to use key software and resources in the process of research is characteristic of the research communities that exploit electronic communities.

Where the software environment facilitates seamless integration between core research software and information with electronic communications, some significant transformations can occur which allow for evolution to occur within the subject.

The transmission of more complex information through electronic communication, objects and models that are more than pictures, structured data rather than tables, allows collaborators to participate more effectively at more stages of the research. More complex communication patterns allow different models of research to evolve.

From the limited number of cases where this has occurred it is of interest that key international researchers have supported the change.

Finding 10: Where the complexity of information that can be communicated, or the speed at which it can be exploited, has increased, evolution in the process of research can occur.

In other cases, where scholarly communication was used for advice and guidance, there are critical factors which transform the provision from an opportunity to essential - such as a premium on speed, or exclusivity and unavailability through any other medium.

We have noted the significance of commercially valuable material or software being made available to the educational world (through price reductions or deals) leading to a step-change in the value of working with IT and electronic data manipulation.

Finding 11: The availability of commercial quality specialist software at educationally affordable cost, can act as an important catalyst to scholarly communication at the sub-discipline level.

There was no mention of teaching, nor course management as a core academic activity, nor for other institutional information (though neither was it directly solicited).

2.5. CHANGING ASSUMPTIONS:

2.5.1. Assessment of Quality

The editorial process manages the quality of material that goes into the critical record and currently represents a binary decision - in or out of the record, based on assessment, by the referees, at the time of submission. This approach to assessing quality is under pressure from developments in electronic scholarly communication. The opportunities presented for the electronic dissemination of new knowledge, through time limited but more targeted, mechanisms (such as pre-prints, informal discussions and virtual conferences), serves to make new, but un-refereed knowledge available to a limited community significantly before formal publication (Sections 4.2, 5.2 and 6.3).

Finding 12: The assessment of quality management of journal and conference contributions, currently maintained through the process of refereeing, should be reviewed to consider the potential of assessing the quality of other forms of electronic communications.

The traditional assumptions which make a library the best place to collect scarce academic (paper) resources is being overturned by the electronic delivery of materials from other sources. Whereas selecting materials and accessing them could happen at the same place and the same time, the emphasis for the library is moving to a separation of the two activities. The emphasis is now on supporting the researcher, with limited time, to identify the resources that would be most appropriate (the economy of attention) and then supporting the retrieval of what is needed (Sections 5.2, 6.3.4).

Recommendation 3: Research should be undertaken to explore the potential to capture and structure meta-information about the qualities of a scholarly contribution, of any type, and to include such meta-information in indexing services.

Much the same processes appears to be re-valuing archival material, with well-indexed and easily retrieved material taking precedence over material whose retrievability is mediated (and financially controlled) through library staff through traditional methods. Alternative, immediately available though less complete resources can produce effective results with less effort. Early evidence suggests that this does not lead to loss in quality of information retrieved. (Sections 5.4, 6.3.4)

Recommendation 4: The potential to replace commercial, on-line services through the integration of less expensive services, should be explored where the cost of commercial services is considered to limit scholarly research.

This seems in turn to be changing the nature of publishing, and categorisation of material, with increasing emphasis on nature and quality of metadata associated with a publication (Section 6.3.3).

2.5.2. About Relationships

We have noted the importance of an existing academic community which is able to take advantage of the opportunities presented by electronic communication. This sort of community might be characterised as a group of people who meet together, share anecdotes, know the boundaries of their world, have a shared values within it and have gained benefits from working together. We have been looking at the ways these activities have transferred to electronic communication (Section 6.3.2).

It is clear that a much larger number of electronic newsgroups are established than are actually used (e.g. within Mailbase), and it is also clear that on many newsgroups the number of active contributors is a small proportion of those who receive the information.

Models of etiquette have developed to ease and improve the quality of communication, within a newsgroup, though as each group is constantly being joined by new members, and losing others, these models are simple and not growing in elaboration. It is in exclusion that such unstructured groups most powerfully describe themselves - what transactions are described as unacceptable, which members should desist from further contribution - though in themselves such moments of cleansing and redefinition can be destructive.

There is more to communication than just interest in the subject - matters of tone, pitch, voice, focus on audience and levels of expectation are equally important. It is in the sub-area of owned, moderated or managed discussion groups that new and possibly more creative forms of etiquette are being developed - the use of introductions and induction, the selection of topics, the prompting and perpetuating of areas of interest, the encouragement of atmospheres of creativity and open-mindedness, the blocking of unsuitable self-promotion and advertising, the creative use of archiving, the making links with other parts of the territory. Although progress is currently slow, it is clear that research in other fields (e.g., computer supported collaborative working) will lead to improvements in this area.

Finding 13: The current technical support for electronic newsgroups, and the social constructs that are currently recreated through them, provide only limited support to establish group cohesiveness without additional opportunities to define group identity.

One of the clear outcomes of the three consultation meetings during the fieldwork was the evidence that some mature e-mail users have built a network of contacts so powerful and extensive that it has diminished the need to work in subject-based departments (Section 5.2). It has always been the case that university staff have seen themselves as members of two institutions - their university, and their discipline or profession. Many of the benefits of physical location which have hitherto justified the formation of subject-focused workgroups are now giving way to more selective and personally-appropriate electronic contact groups. This is not a new phenomenon, but the difference of degree is creating a real difference in kind.

As the network of desktop computers spreads, and as new cohorts of users are introduced to the opportunities, two features seem to repeat themselves - enthusiasm for the imagined possibilities and despair at the quantity of communication which now has to be handled. Mature users often look to anticipated technical solutions to make automatic judgements and impose hierarchies of value; it is clear from anecdote that some colleagues are withdrawing until they have found ways of defending themselves against what feels like assault (Section 5).

There is still a lot to learn about best use of new media, and each new user has a few technical skills to learn. There is a social aspect to the evolution of email lists and newsgroups. where:hand-holding, hosting, mentoring, advising, guiding , supporting the induction of new members, developing etiquette and standards of behaviour within the community are all as important to facilitating scholarly communication as access to usable technology.

2.5.3. About the Ownership of Knowledge

The academic community has developed protocols for the creation of knowledge and the ascribing of ownership to the creators of knowledge. Some of these protocols may be in the process of revision as the development of electronic communications accentuates conflict between models of individual and co-operative creation and re-shapes the communities themselves (Sections 6.3.2, 6.3.5).

The development of approaches to scholarly communication has been in the areas which are least attended to by our traditional model of knowledge creation - the seeding of discussions with initial ideas, the easy exchange of drafts, the shared process of creation (perhaps to the point at which any product is secondary), distribution to far more extensive, narrow-cast, readerships before broad-casting, controlled and local discussion before widespread debate; co-operation rather than national or international competition (Section 6.3.2).

Finding 14: The most interesting approaches to scholarly communication are in areas which challenge the traditional model of individual research achievement and the reward for the ownership of such research.

This is in contrast to the potential for new electronic journals to establish themselves - since established journals are those that serve clear communities and already have a defined readership, though simple replication of paper traditional thought electronic publication is unlikely to bring advantages (Section 6.3.5).

Evolutionary change occurs where the new conceptualization of research is closest to an existing disciplinary tradition. Such change has occurred and will continue to be accepted

unless the academic community fails to remove artificial barriers between electronic and paper publishing.

Finding 15: New electronic journals are most likely to alter the nature of research when based on an existing readership and offering an evolutionary change in the method of research.

Where new publications attempt to establish themselves, they face the inertia of establishing a community at the same time as seeking change. The future of such publications faces the inertia of an academic reward structure that has no motive to change. Such attempts may be interesting, may test new models of communication, but are unlikely to change their own discipline.

Finding 16: Attempts to produce radical change in the approach to research, and recognition of contribution to research, can expect to meet resistance in well organised, international disciplines.

3. INTRODUCTION TO THE STUDIES

3.1. ABOUT LANGUAGE

The prevailing language of the discussion about electronic scholarly communication is that of paper publishing - for example, writing a paper for a journal, submitting it to an editorial board, having it refereed and published to an issue deadline. Editors and their boards give their publications a character, the assumption being that a reader might be interested in the whole package.

The academic community has used this existing glossary to describe and develop the different world of electronic communication. It is important to be alert to the possibility that the associated conceptual framework is now inhibiting further development. It is also important to watch for the development of new language (e.g. Section 4.5), different metaphors and apparently irrelevant developments in other parts of the electronic world (gaming, for example, which as been used so often in the past as the familiarisation and training framework) in order to chart future progress.

3.2. CHANGE MANAGEMENT AND COMPUTER INTERFACE DESIGN

Two significant bodies of knowledge underlie much of changes that we are describing. Many changes have occurred so far through evolution supported by key participants in each community. If the advantages are to be transferred to other communities change management will have to become more pro-active. We do not intend to review that literature and presume that it is well understood by those who will read this report.

For a somewhat different reason we do not expressly review material within the human-computer interface (HCI) design field. although the software interface has been noted as a significant barrier to the establishment of electronic communities, advances in this field will continue, and specific issues in scholarly communication will be addressed through more general considerations, particularly through work in computer-supported collaborative working (CSCW).

4. THE CASE STUDIES

This section is organised in the form of an introduction to the study (Section 4.1), followed by a summary of issues across all of the disciplines in the study. The remaining sections detail key points from each of the separate disciplines.

4.1. INTRODUCTION

The project was asked to look at three case studies of electronic journals which were funded by the eLib Programme. The journals chosen were JILT, CLIC and Formations. Meetings were arranged with each of the project teams to discuss their work.

During these meetings we asked each team to describe what they were doing, questioned them as to how academics used their electronic journals, asked how their audiences undertook research in their particular discipline, and whether electronic communication had changed their practice. (Full records of these meetings can be found in Appendix 7.1.)

Inevitably the conclusions drawn here are based on these particular projects and should be viewed that way. However, general conclusions may be drawn and three different models of electronic journals were extracted.

It should be noted in reading this that both JILT and CLIC were live projects in use by their communities, while Formations was still in the development stage and not yet live.

4.2. THE CASE STUDIES SUMMARY

The three eLib projects provided us with a variety of different models of scholarly communication. JILT offered a traditional journal on the WWW with elements of added value (for example, links to on-line resources and a news service).

CLIC was an electronic conference complete with a refereeing process. The outcomes from CLIC were subsequently published on CD-ROM which allowed the viewing of articles with 3 dimensional images. It also offered the added value of being able to publish in 3 dimensions and offer the dataset for an article.

Formations, when live, will allow participants to create the final product of an issue together with an open review process using commercial groupware. There are some clear issues which can be drawn from these examples.

The term 'electronic journal' was used to encompass a number of differing scholarly communication and publication processes. The meaning of this term is still developing. Its present use is so wide ranging that it ceases to be useful.

Scholarly communication within electronic journals included a number of processes: reading, replies to traditional style articles, the ability to rework an articles original dataset, discussions of refereed and non-refereed papers by e-mail, the collation and discussion of information by e-mail and ftp (file transfer protocol), and open and closed refereeing mechanisms.

As regards publication methods, one journal mirrors the paper publication process, others used the medium to publish in ways which are not possible on paper, and one used a parallel

publishing method by CD-ROM. JILT and CLIC were aware of and being used by their communities. JILT was experiencing a slow flow of articles in, but this was probably to be expected when one compares it with the time taken to establish a traditional refereed journal. In comparison CLIC supporting an existing face-to-face conference by holding an electronic conference inevitably led to more discussion of issues and papers being submitted. Essentially its audience was already established.

However, both CLIC and JILT did rest upon traditional forms of communication: conference, papers, posters and e-mail discussion after publication whereas Formations was proposing a more radical approach. Their approach was a wish to create quality material collaboratively on-line.

4.3. KEY POINTS FROM JILT

- The JILT team knew that the Law community was splintered - for example, English and Scottish law differ, and professional and academic lawyers too. Subject supported is very focused - Information Law and Technology.
- JILT represented a traditional paper-based model of a journal on the WWW.
- Quality assurance was provided by refereeing articles.
- It was the first electronic journal in a strategy, involving a number of electronic law journals called the Electronic Law Journals Project, which through reaching a critical mass would mean that more lawyers would use electronic law journals as a result.
- Added value different to the traditional model included: include: news service, links to other web resources, issue pages, software reviews and demos, a pre-print service, opening up an international community, and discussions on articles.
- However, they were additional to, rather than elaborations of the traditional model.
- They were experiencing a slow flow of articles.

4.4. KEY POINTS FROM CLIC

- Working with an existing community.
- Working in a community which collaborates internationally on research.
- Importation of core academic software from industry.
- Software extended and improved their common language from a 2 dimensional into a 3 dimensional domain.
- This again complemented and improved their process of scholarly communication.
- They published enhanced articles with 3 dimensional models on the WWW.
- Issues of CLIC complement the existing process of scholarly communication: an electronic conference is held in the lean year between a face-to-face bi-annual conference.
- Parallel publishing on the WWW and CD-ROM.
- CD-ROM solved the problem of recording the outcomes of the conference.
- It also allowed 3 dimensional images to be viewed without having to access the internet.
- Posters and papers could be submitted to the electronic conference.
- Only papers went through a refereeing process.
- CLIC is an electronic conference which includes refereed papers rather than a traditional electronic journal.
- Subject supported is very focused - organic chemistry.

4.5. KEY POINTS FROM FORMATIONS

- Electronic journal still in development and not yet live.
- The team want the journal to facilitate collaboration.
- Using software, specifically groupware developed by industry which allows collaborative work to take place.
- Different topics will be available for discussion. These are to be called Channels.
- There will also be different Venues to discuss these topics in, for example both informal and formal discussion groups.
- There was a social domain to the Venues and Channels. Channels were to be facilitated by a host (an individual with some standing in the appropriate subject area).•
- Subscribers to a Channel will donate material on the topic. Such material will include: discussion, bibliographies, papers, articles, comments on articles, any media that the groupware will allow.
- The potential to use multi-media is present.
- Issues of Formations will be selections of material which is presented to Channels and chosen by hosts.
- There will be an open review process as the best parts of Channels would become visible as they are discussed, donated and developed on-line.
- The refereeing process would therefore appear to be open.
- The journal will offer a place to discuss ephemeral material which can then be archived. Such discussion on performances which might otherwise occur in places like corridors and bars can be archived in Formations - it would otherwise be lost.
- Subject area covered has a potentially wide audience encompassing cultural and media studies.

5. THE CONSULTATION EXERCISE

This section is organised in the form of an introduction to the study (Section 5.1), followed by a summary of issues across all of the disciplines in the study (Section 5.2). The remaining sections detail key points from each of the separate disciplines.

5.1. INTRODUCTION

Three groups of staff, each representing the disciplines of each case study, were contacted by e-mail, through list servers, to come to separate half-day seminars to discuss the question: How has the use of e-mail, electronic journals, the world wide web, gopher, file transfer and usenet newsgroups changed your working practice in Law, Chemistry or Cultural and Media Studies?

Delegates were free to set the agenda themselves. Meetings were attended by academic staff, librarians, service providers, professionals and post-graduate students. Full records of the events are available in Appendix 7.2.

5.2. THE CONSULTATION EXERCISE SUMMARY

Although differences existed between the three groups it was remarkable that they were discussing around themes common to all groups. These included:

- the use of the internet to access resources or communicate;
- their disciplines level of use of the internet;
- models of cultural change; and
- communicating and its relationship to creating knowledge.

These will be dealt with in turn.

The lawyers were aware of the availability of resources through the internet like Lexis and databases of court reports, but they did not discuss their use of these resources. Cost of access seemed to be prohibitive. The chemists used on-line services extensively in their work, and saw the lowering of cost of such access as increasing their use. Cultural studies staff were concerned about access to primary resource material on-line and wished it to be a reproduction of the original text or image and the need for a good meta-data control language for searching.

As regards using the internet to communicate the lawyers cited examples of the judiciary and tribunals service using e-mail to communicate effectively. However, they saw their own academic communities as being less developed and focused in this use. The chemists different substantively from both the lawyers and cultural studies group here. They were using a communication process which actually developed the way in which they could communicate. It involved the use of 3 dimensional images. This was an enhancement of their existing method (see Section 4.4). The cultural studies group were enthusiastic about using the medium to communicate. They saw its potential and wanted to explore it.

The lawyers did not see their discipline as heavy users of the internet. The chemists, however, did. It was clearly a part of their daily working practice. The cultural studies staff, like the lawyers, felt that they were running behind the developments in technology and were technologically poor (minimal access to the necessary resources).

Although models of cultural change were not directly mentioned, ways in which they had seen practice developed are worth commenting upon. The lawyers noted two examples of champions being used to motivate others to use the internet. The chemists saw that developments in technology had enabled them to develop and change. These seemed to be a natural development without the need of champions. Cultural studies staff saw the potential for creating on-line communities.

Finally, issues were raised on communicating and its relationship to creating knowledge. The lawyers thought that the use of e-mail had led to more collaborative work, but did not comment on whether this had improved the quality of their work. The chemists found that the ability to use 3 dimensions to communicate had enhanced their ability to describe and develop knowledge. Furthermore, they expressed frustration that experiences of submitting such work to the RAE had failed when similar work in 2 dimensions had not. This is a serious issue. In cultural studies the medium was seen to affect how knowledge was developed. They identified the fact that the medium you write/create with affects the outcome. Indeed some arguments can only be presented in 2 dimensions. They, like the chemists, expressed concerns about the RAE. However, their worries were not about the fact that knowledge could be better expressed in a format which was not easily accessible to the RAE, but that even traditional style journals on the internet were having difficulties in being recognised.

5.3. KEY POINTS FROM LAWYERS

- The community is not yet 'wired up' or very electronically aware.
- Not enough of the community using e-mail within departments to make it worthwhile.
- Anecdotal evidence of sending paper and e-mail out, but e-mail not being responded to.
- American lawyers cited as being more on-line and 'wired up'.
- Evidence given of using champions or enthusiasts to change practice.
- Good use of electronic communication by Judges to discuss sentencing and new legislation.
- Similar use by judges of the Independent Tribunals process.
- No evidence of private law practice influencing higher education practice.
- E-mail thought to produce more collaborative work.
- Many on-line services available for the subject, but not particularly mentioned by the group.
- On-line services known to be prohibitively expensive, particularly when staff wished to use them for teaching.

5.4. KEY POINTS FROM CHEMISTS

- They were a 'wired up' community of mature technology users.
- Group of micro-biologists/organic chemistry staff attended.
- Very similar to the group which CLIC supports.
- Industry designed software becoming available to education.
- On-line searching techniques had expanded from two to three dimensional.
- On-line searching becoming cheaper.
- Librarians were no longer always holding the purse strings to access to these services.
- Desktop access to these services available and being used.
- Academics needed to trust the results of their searches.
- It was essentially that they knew of everything that had been published on their area of research.
- Collaborative working was common to organic chemistry.
- Cited other chemists including inorganic and physical as gaining from different advances in technology and software at different times.
- One delegate had offered WWW published documents for the RAE and had them rejected. They were subsequently published elsewhere. Delegates were concerned over their exclusion since the quality of research was not at issue.

5.5. KEY POINTS FROM CULTURAL STUDIES

- Enthusiastic about the potential use of electronic communication.
- Saw the potential of using it to create communities.
- They wanted to explore the social dimension.
- Also identified e-mail as changing traditional discourse - it was becoming more chatty.
- Recognition of the need for good meta-data searching devices.
- Noted that some arguments rely on the use of printing them on paper.
- The medium influences the outcome.
- It affects the creation of knowledge.
- Concerned about the electronic preservation of primary sources and the loss of personal imprints on papers and books (e.g. underlining, notes in the margin etc.) Concerns expressed over the RAE and whether outcomes of research published on the WWW would be included.
- They thought that their discipline was running along behind developments in technology.

6. LITERATURE REVIEW

6.1. METHOD

6.1.1. Introduction and Exclusions

Within the scope of scholarly communication there are a number of stakeholders with different and conflicting interests [Shaughnessy 1989, Ginsparg 1989, Atkinson 1996]. As Shaughnessy notes, scholarly communication is so vast a topic that no single group can study it. He cites the failure of even a team approach to study in 1983, because each group had different motives and objectives for involvement. Albach [Albach 1989] also notes this and adds that there are a number of communities involved in the scholarly communication process which do not have a united voice. Publishers do not promote resource sharing, both academics and students have no organised voice, and university libraries have a weak voice .

Shaughnessy suggests that the recommendations made in 1975 which led to the team approach attempt in 1983 still needed consideration and could offer ways to unite these groups and strengthen their voices. These included: to link bibliographical systems, to devise co-operative ways of resource sharing, to forge links between different members of the scholarly communication community, to co-ordinate efforts e.g. preservation, to monitor government attempts to limit information flow, and to exploit new technology.

Even if one accepts that bibliometric studies are the way to measure then one is still left with insurmountable difficulties. For example, as White states, the level of work that is never cited in science and humanities is heavily overestimated [White, 1993]. Most analysis is undertaken at a discipline rather than sub-discipline level. He finds that at the sub-discipline the level of uncitedness drops in both the humanities and science. This is mainly due to previous studies including book reviews and conference proceedings.

However, in addition to stating that bibliometric studies will rarely be perfect, he also notes that for a text to be uncited does not mean that it has not been read. It could well be an important addition to the knowledge base of the subject and be communicated. Many may read or scan [Odlyzko, 1995] and use the information without citing it. It becomes a semantic memory. Thus how knowledge is seen to be valued by its communities is an influencing factor in its creation and subsequent discussion and acceptance.

Progress has been made since 1989 in understanding these relationships as electronic communications increase their impact on publishing and the development of research, though inevitably limited by the slowness of new journal start up and, where used, the latency of citation analysis [Harter, 1996]. This study focuses, in particular, on the relationship between academics and the scholarly communication process where this affects the quality of academic research. It is intended to present a view of the influences that affect the decision making in academic circles. Within this context, decisions can be taken as to which aspects will or will not succeed in changing the behaviour of the academic community.

The impact of scholarly research on other organisations are not considered as a separate issue ([Lamb 1997] provides an introduction to this). Similarly, where the library is discussed, it is in the context of how an academic uses it to conduct research. Copyright is not considered explicitly.

6.1.2. Method

Comprehensive literature search across a broad range of issues, identifying approx. 300 articles. This was complemented with a quick review of material available through the internet. The range of issues within this set was wider than required for the study and, to reduce this range a conceptual model as overview was produced, based on the scope required for the study and an initial impression of the literature.

The articles were then independently reviewed as abstracts by two of the researchers, reducing the total number to a target set of 90 identified as being of potential interest by at least one of the two researchers and written within a plausible timescale for the issues discussed to remain relevant. To partition the set for further review the articles were allocated to various nodes on the conceptual model and allocated, as they became available to the researchers for review. Not all were able to be retrieved within the time scale for the study.

In parallel to this conventional literature search, a more detailed review of material was conducted on the internet, including an extensive bibliography [Bailey 1997]. Comparison between the resources discovered and the internet resources indicated that there was considerable divergence, reflecting, by and large, a different set of journals, with authors, apart from a common core, restricting their publications to one or other set of journals. Since the bibliography from Bailey reflected a more American literature set, these articles were used primarily for comparison. Articles of potential interest from this bibliography that were available on the internet were downloaded where possible and used for comparison purposes.

6.2. OVERVIEW OF MAIN MODELS

These articles that form the basis for this review revealed a lack of consistency in the terminology applied to the field. Some 900 key terms were used within the initial 300 articles and, though this may have reflected the broad range of disciplines contributing to the background, this was reduced to only about 350 when the set was reduced to only 90. In many cases terms that are identified as keywords in some parts of the literature (e.g. "Scholarly Communication") are not identified as keywords even if they occur in the title of other articles.

6.2.1. Terminology

In order to write this review it has inevitably been necessary to define a reduced set of terms that allow discussion within a unified framework. Where possible we take terminology from a clearly identified discipline and in other cases we have had to develop a terminology ourselves. In either case this may appear to misuse terms that have a specific meaning within a particular discipline and we apologise in advance for this.

Research resulting in some form of publication is a multiple stage process, requiring different patterns of scholarly communication with different patterns of behaviour and information use. Michelson, for example, offers five communication behaviours: four linked to the research process - identification of sources, communication with colleagues, interpretation and analysis of data, dissemination of research findings followed by a fifth - curriculum development and instruction for preparing the next generation of scholars. Ellis, applying a grounded theory approach to information use across different disciplines found commonality for six types, with the first 'starting' using a combination of human-human as well as computer-based mechanisms [Ellis et al, 1993]. Reporting an ethnographic study by Amman and Knorr-Cetina, Ercegovac

highlights a more detailed range of scientific exchanges. Working with scientists in a molecular biology laboratory this included: procedural reconstruction, adversarial review of alternative proposals, induction from visual diagrams and thinking-aloud patterns [Ercegovac , 1992].

Scholarly communication has therefore to be seen in a wider sense than communication through formal publishing. Although the traditional print record represents the most visible aspect of scholarly communication and the one in which libraries and publishers have most significantly contributed, it is only the last two of Michelson's stages that are reflected in this process.

Scholarly communication in the traditional academic press, as a refereed journal or a book, where this also includes reference through information sources, has the effect of 'broadcasting' knowledge into the public domain. Such knowledge forms part of a 'critical record', archived and publicly accessible to those who could potentially have an interest. As a broadcast communication, it is then incumbent on other academics, as potential recipients, to be aware of its existence and, to acknowledge it within the citation etiquette of the discipline.

Whenever academic research leads to new contributions in the 'critical record', benefits will occur from the use of the record in three different systems. Firstly, as a significant contribution to the academic record it can lead to further contributions to the academic record irrespective of who benefits from future use, though individual credit will accrue through genuine citation [Budd, 1989].

Secondly, as a quality controlled contribution to the public record it can lead to increased status and recognition. Authors (with experience) send an article for publication to the one most likely to accept it in terms of the relevance of the publication [McDonald and Feather, 1995] whilst maintaining consideration of the potential value of their career through consideration of credibility of the journal [Burbules and Bruce, 1995] and the likelihood of future citation. The value of particular journals can be assessed both in terms of their academic status, but also from the prestige status that certain journals are awarded by reference and commentary in the wider press leading to benefits for grant applications [Abelson, 1990].

Thirdly, at a lower level, it may contribute to the educational process of producing future researchers, either from a junior researcher, as a less significant contribution to the 'critical record' or in a literature review, bibliography or collection.

Scholarly communication also exists outside of the broadcast, 'critical record'. These, narrow-cast, forms are restricted to a smaller, more clearly identifiable community or group, where the community is both smaller and also more likely to share values and interests with the sender of the message (see Section 6.3.2). Such a group of recipients is either chosen explicitly by the author, or identified through shared membership of an interest group. Where scholarly communication is used in this sense, it is necessary to identify the group and common interest, as well as the content and medium of the communication.

6.3. SPECIFIC TOPICS

The discussion that follows is arranged in four sections.

Initially we consider the evidence from the literature to support our contention that the differences between disciplines and within disciplines affect the nature and potential for electronic communication. We suggest that, within the scope of what the academic community can achieve, effecting change must be considered at the discipline or sub-discipline level and not at a more global level, even though more global forces may act otherwise (Section 6.3.1).

Next we consider patterns of communication as they relate to the creation of knowledge. Although this is a more generic topic, the potential for electronic communication to influence or accelerate the research in each discipline will depend on the significance of communication with colleagues at different stages of the research process (Section 6.3.2).

Next we review two specific models, (from [Ginsparg, 1996] and [Atkinson, 1996]) that we feel are sufficiently generic to provide a framework for discussion of scholarly communication both with and without the benefit of electronic communication. These highlight a series of issues that allow some of the future benefits to be identified alongside the changes that are necessary to facilitate them (Sections 6.3.3, 6.3.4).

Finally we review some of the potential changes that could take place (Section 6.3.5).

6.3.1. The differences between disciplines

Differences between disciplines, and sub-disciplines arise directly from a complex matrix of factors, such as values, the conduct of enquiry, and form of collaboration, are inherent in the nature of enquiry within a discipline. Further differences are generated from the interrelationship between a discipline and its use in the external world. Others, such as the use of information technology and electronic communications, are individually dependent on these factors and, more in a more complex way, through the potential interplay afforded through the ubiquitous nature of information technology.

It is relatively easy to find differences between groupings of disciplines in terms of their general characteristics. Becher [Becher, 1994], noting that different approaches to classification by Kolb and Biglan produce the same, broad 2 x 2 classification of disciplines (following Kolb's terms this is : abstract v applied and reflective v active). He extends this to an anthropological view which characterises, for example, the 'close-knit epistemological structure of high energy physics research' as 'fast-moving, competitive, densely populated - one might say urban - community' and 'the loosely-structured intellectual arenas of modern languages' as 'the leisurely uncompetitive pace and scattered rural societies of the related specialist groups' [Becher, 1994, p.153]. Disciplinary cultures transcend national boundaries, as demonstrated by staff movements and international groupings, common source texts, frequent international communications etc. [Becher, 1994].

Such broad characteristics are also reflected in the resources that are used for research, and the way in which new contributions to the critical record are made.

Defining Standards

Publications in the areas of science and mathematics will apply well defined standards of scholarship across all publications. In mathematics refereed journals are assumed to be 'correct' [Odlyzko, 1995] whilst in science, Abelson cites reproducibility as the key to 'health of science'. Outside mathematics and science, publication to test truth [Bennett 1996] replaces

publication as truth . Beyond agreed quality standards, selection for publication is influenced by a range of less tangible issues. Abelson suggests a limited number for science including 'it answers a much-asked question', 'it opens up a new field of inquiry' or 'it proves that existing data or theories are incorrect' [Abelson, 1990, p.217]. Popkin identifies the aspects of influential formulations and interpretations as the qualities expected in the general area of the humanities, [Popkin, 1990]. However, such a clear approach is not necessarily repeated throughout a discipline. Emergent disciplines, such as Information Systems, can suffer from the lack of an agreed theoretical basis, with fifteen different criteria being detected in one study of publication standards [Straub et al., 1994]. Other disciplines reflect a shared value system only within one of a number of theoretical approaches. Such a distinction will be necessary across both pure (e.g. history) and applied (e.g. criminology) fields.

The process of peer review has been variously advocated as the gold standard, or a system ripe for change [Moran and Mallory, 1991]. Others believe the situation needs to be reinforced with a code of ethics [Carland and Others, 1992]

Resources

Significant differences on a broad scale have arisen in the priority given to the development of on-line resources. Whilst many disciplines have focused on making the critical record available, others have made presentation of primary sources the focus.

Shreeves, reviewing resources in the humanities, considers that the most significant contributions have been the conversion to machine readable form of all known texts in a particular field or sub-field (e.g. Thesaurus Linguae Graecae and the ARTFL database of French Literature) [Shreeves, 1992]. Sweetland, citing [Gould, 1988] agrees with this but also raises the need to access a richer, visual resource that would include drafts, marginal notes and editions [Sweetland, 1992].

Where the value of sources is concerned, the quality and authenticity of the text is being judged. In assessing text reviews the selector analyzes the reputation of the editor, the value of added material, such as introduction, notes and critical apparatus, the prestige of the publisher or series in which the text appears and the care and accuracy with which the text is established' [Shreeves, 1992].

Timescale

Such an approach to discrimination between sources is reflected in the length of time during which a contribution to the critical record remains relevant. In consideration of this in discussing Humanities, Popkin (and similarly [Sweetland, 1992]) raises issues such as speed of publication, latency (time during which a contribution is in gestation anyway), hidden (Isaac Newton example of unpublished paper), length of time during which an article remains important to new research and, citing a paper by Isaac Newton, the time during which it will be deliberately 'hidden' [Popkin, 1990]. This is in sharp contrast to the development of pre-print services in other disciplines such as physics ([Ginsparg, 1996]) and mathematics [Odlyzko, 1995]. Albtach claims that the fast transmission of ideas is not as crucial in humanities and social science as in science [Albtach in Shaughnessy 1989].

Just as it is not possible to place a single value on a scholarly communication (e.g., [Baird and Oppenheim, 1994] cited in [McDonald and Feather, 1995]), there can be no absolute point in

time at which a scholarly contribution will no longer have significance, it is clear that what is characterized here is reflected in academic behaviour. A more useful approach might be to characterise a discipline by a half-life of its contributions, the period over which only half of the contributions remain potentially significant.

The discussion so far has treated academic research in isolation. Scholarly communication is clearly dependent on both the other scholars in the field and the other organisations who are also collaborators, or who share common resources.

Rolinson and others, in a study of researchers at an agricultural faculty, a university school of biology, a government research establishment and a pharmaceutical laboratory, found significant differences, particularly in the extent to which commercial enterprises are able to provide all the facilities required, and that the pressures there ensure that these facilities are used [Rolinson et al., 1995].

Location

Some subjects differ in the geographical placing of their colleagues. Some share the same department, others may have to communicate nationally because they do not share common interests with their local colleagues. This is frequently the case in the humanities [Schwartz 1994]. However, international collaboration can be restricted where national standards (professional - e.g. accountancy) generate different issues. This distinction is raised by Becher as to the tendency within some disciplines to engage in PQ professional development (e.g., Business, Engineering) [Becher, 1994].

Collaboration

The nature of collaborative teams is also of interest. Nudelman and Lannders, establish in a study that academics allocate more value to collaborative work [Nudelman and Lannders in Harsanyi, 1993], but this may not necessarily relate directly to the quality of the result. For example, it may merely reflect the degree of financial support in a discipline, since this is also related to collaboration [Beaver and Rosen, 1979 in Harsanyi, 1993].

Price, however, states an alternative position [Price, 1970 in Harsanyi, 1993]. He claims that collaboration reflects economic rather than intellectual dependence in some disciplines rather than others, where access to resources is restricted. White states that collaboration increases with complexity of the research because of the need of expertise unavailable in the skills of one individual [White, 1991 in Harsanyi, 1993]. Heffner also found that collaboration reflected economic rather than intellectual dependence in chemistry and biology, but not psychology and political science [Heffner 1981 in Harsanyi 1993]. Abelson also notes the implications for so quality in publication, where unique access to special reagents limits potential for reproduction of results [Abelson 1990].

More generally, Logan and Pao identify that the most connected (those with the most contacts and connections in their community) get the most grants and produce most papers [Logan and Pao, 1991].

Application of Information Technology

Beyond the intrinsic nature of a subject, significant differences exist in the extent to which information technology has already penetrated into the study of a discipline. This is sometimes

treated as a truism (e.g. Michelson and Rothenberg - "end-user computing enhances the autonomy of the researcher - to use the power of computation to conceptualize and execute research without sacrificing intellectual control by delegating computational tasks to specialists."). Such a simple model might suggest that uptake would be more associated with younger researchers with greater exposure to information technology but the problem may be more complex [Rolinson et al., 1995]. Consideration of the literature suggests that the extent of information technology penetration is more directly linked to the specific benefits that result.

In a comprehensive study of information usage in Chemistry, Philips, set out to review why study in a subject which offered some of the best IT solutions, available on a PC, had not resulted in a universal take up, including 'systems for handling data such as chemical reactions, chemical and molecular properties, spectral/structural data, synthesis planning data as well as more conventional bibliographic systems and resources. Despite the significant importance of the on-line resources, significant differences were found between the separate branches. Physical chemistry, which was 'more suited to alphanumeric format', showed less uptake, reflecting the lack of specialist systems within that particular branch, as well as a greater reliance on intermediaries to use the systems, whereas structural systems were used by the researchers [Philip 1995, Philip 1996].

Boguski reports the development of the 'Entrez' systems that directly exploits the synergy between on-line resources. This exploits the consistent structure inherent in the Human Genome Project to provide links between databases for protein sequences and nucleic acids and the MEDLINE index of biomedical journals [Boguski, 1995].

In contrast, attempts in the environmental science field to link similar sets of database resources have been restricted through a lack of common terminology [Ercegovac, 1992]. Sweetland reports a similar problem of terminology in the arts and humanities. Here the problem can be further exacerbated by aspects such as explicit equivocation, semantic drift, and working in more than one language, particularly following automatic indexing [Sweetland, 1992].

Sub-discipline Analysis

The discussion above suggests that differences in uptake of information technology between disciplines are characterized by a range of factors, many of which are not specifically related to the broader characterisation initially described. Further, some differences and similarities are only evident when the process of research is broken into a series of processes.

This is reinforced by a series of studies by Ellis and others which compared the information searching behaviour across three disciplines, Social Science, Chemistry and Physics [Ellis et al., 1993]. Six patterns of search were found for all three subjects, but it was only Chemistry that revealed differences. Odlyzko, in reference to Quinn [Quinn, 1995] suggests that pre-print process differs in the nature of refereeing between Chemistry and Mathematics [Odlyzko, 1995].

Clemens and others reveal that gender, rank, and type of institution (public or private) play an important role in the reception and dissemination of academic research even within a single field [Clemens et al, 1995]. Lindholmromantschuk and Warner suggest that the initial high

impact of monographs leads to more impact and citing articles for that author in all disciplines [Lindholmromantschuk and Warner, 1996].

The preceding discussion has emphasized the differences between disciplines, focused on the development of knowledge through formal publication in refereed journals or books. Many of the existing electronic journals are simple analogs of existing print journals, with little change, other than publication speed, over their paper incarnation (e.g., the Journal of Artificial Intelligence Research, [King and Covi, 1995]). Many of the potential changes, however, arise from the exploitation of more informal communications, within more selective groups of researchers.

6.3.2. The Ways In Which Communication Contributes To The Creation Of Knowledge

Advances in communication technology can be seen to have effects in three distinct aspects of the scholarly communication system.

There are, of course, evident changes in the potential for new technology to change the composition of groups, and qualitative differences in the communications that take place due to changes in the medium of communication. These changes must be evaluated in the light of the changes that result in the construction of new knowledge.

Secondly, where communications can be used to capture the process of the construction of knowledge or the evolution of research, such materials can provide a valuable educational, resource material .

Finally, the potential success of such changes, in producing qualitative benefits in research, may depend on the acceptance of new approaches to working that challenge current practice and existing meritocracies (see section 6.3.5).

The evident changes have been noted by several authors. With the potential to communicate with a more geographically distributed and larger set of collaborators, researchers have the opportunity to collaborate at different stages of research Berge and Collins, and to maintain international relationships more cheaply [Berge and Collins 1995]. However, except where this supports a community that would not otherwise exist, the benefits are not so self-evident. Berge and Collins also state that discussion allows a better development of ideas [Berge and Collins 1995] - but this is beneficial only where the discussion is not otherwise occurring. To be beneficial it must be shown that the ideas that result are qualitatively better. This must depend on the group that is involved and the quality of debate that is possible through the medium chosen.

The current technology, increasingly integrated through the Internet network and World Wide Web interfaces, offers a range of narrow-cast communication styles both between individuals and between groups. Simple electronic mail (e-mail) and newsgroups support asynchronous discussions between groups, whilst internet relay chat provides a simple interface for synchronous discussion. Developments in multiple user environments (whether from gaming such as MUDs and MOOs) are leading to more sophisticated models of synchronous debate with the benefit of spontaneity, and commercial collaborative environments (e.g. Lotus Notes™) are providing more usable models asynchronous discussion over longer periods of time than are possible with the threaded structure of newsgroups.

In contrast to the synchronicity, asynchronicity allows more time to those communicating to reflect upon their ideas. The generation and dissemination of ideas can be faster [O'Haver, 1995]. Such ideas can be examined more thoroughly by a larger group than normally available and the originator of the idea, and the participants in a discussion, have a greater opportunity to reflect and develop their positions.

Despite the current limits of existing communication technology, advantages are claimed. For example, Harrison and Stephen surveyed a number of studies which show that information exchange with larger groups led to enhanced creative thinking and more examination of complete ideas [Harrison and Stephen, 1992]. Geldenhuys and Human, also, think that the availability of such communications leads to new insights [Geldenhuys and Human, 1996].

Other commentators have noted differences in the nature of discussion. Burton notes that e-mail has an equalising value in that you do not know who is putting forward a comment or idea [Burton, 1994]. It may be an undergraduate student or a professor. Thus, as Kahin claims, e-mail tends to flatten hierarchies [Kahin, 1992] and, as Harrison and Stephen state, good ideas are valued as opposed to whose ideas they are [Harrison and Stephen, 1992]. Lewis, reviewing Pfaffenberger [Pfaffenberger 1986] also comments that such communications, through their lack of formality, can also foster group attachment [Lewis, 1988].

One advantage of the communication process is that it is possible to capture and archive the results. Such records, either between two authors as a sequence (termed dialogic texts) or more generally contributions communications reorganised from a number of messages in a discussion (termed mosaic texts [Burton, 1994]), provide a potential contribution to the critical record, but the acceptability of such contributions raises wider questions (see discussion below).

The capturing of scholarly debate, either in the form of traditional critique or more collaborative evolution of ideas, can potentially provide a rich resource, allowing aspiring scholars can see how scholars communicate - recreating the research seminar [Berge and Collins 1995]. Harrison and Stephen, creators of Comserve view the integration between communication and resources provided by the internet as a key focus for all aspects of a discipline. Comserve provides on-line access to journals, e-conferences, teaching material, as well as contact lists for networking etc. and acts as 'a disciplinary research and education center' [Harrison and Stephen, 1992, p.1]. They believe research can and will be improved, even for those who do not wish to collaborate.

6.3.3. Reviewing of Resources [Ginsparg 1996]

Even ignoring economic arguments, the need to provide greater support for all researchers is accentuated by the increasing volume of material currently published on paper, in an increasing number of journals [Osburn, 1984]. This is evidently the case in the field of Chemistry where bibliographic resources are now essential [Philip, 1995] as the rate of growth in publications increases. Odlyzko reports a current doubling in the mathematical literature each 10 years and in the field of astronomy even lower at 8 years [Odlyzko, 1995]. Bieber and Blackburn cite growth of over 100% publication growth - per researcher - in Biology, and 85% for Psychology [Bieber and Blackburn, 1993].

It might be argued that this reflects a lower standard of publication (Abelson reports that 85% of submissions rejected by Science are accepted elsewhere), or the replacement of one submission with several, [Abelson, 1990, also Bieber and Blackburn, 1993 and Odlyzko, 1995]. However, choosing to reduce the number of journals available presupposes that such decisions could be taken in isolation from the other benefits to the academic scholar of publication, or their available time for reading [McDonald and Feather, 1995].

This section describes two models from the literature, which allow conceptualization of the problems independently of the degree to which information technology is applied and also independently of the specific nature of the resources that provide the content. Given the increasing range of available resources

The first model takes the view of Ginsparg and is based on the physics pre-prints system [Ginsparg, 1996]. This extends the current model of journal publication (and, to a lesser extent, monograph publication) to enhance the quality of information that is available for the selection of material. The second model reinterprets the function of the library as the focus of information provision for research, without the physical restrictions of the traditional print world.

Ginsparg identifies the current process of scholarly publishing as providing a quality control mechanism that guarantees restricts available material to the standards appropriate to that discipline. When the 'publication' of material is freed from the control of the publishers, as he advocates, the quality control process needs to be recreated. It is at this point that significant advantage can be gained from the quality control process. When linked to the print world, publishers are only concerned with a single decision - to print or not, even if the process by which a publishable version is a protracted process. Ginsparg argues that more information is available within the current process, but not captured, and that making it available would improve the selection process for readers. The restriction to information from the current approach to review is not essential and could be replaced, or supplemented, with open peer review [Harnad, 1995], to improve the assessment process [Jones and Others, 1996].

Two advantages arise from adopting this approach, other than the potential for making more public the current review process. Firstly, it allows the review process itself to be cumulative and/or changing as new research allows earlier material to be re-evaluated. Secondly it allows the review process to acknowledge the potential for use in different ways. Odlyzko gives an example from educational use in mathematics citing [Lamport, 1995], where the qualities of formal proofs as required by journals, fail to convey understanding of the mathematical insight underlying the proof. The process also allows, with suitable support, for the inclusion of other

scholarly publications, such as pre-prints, within the same system, as long as the relationship between versions and comments can also be captured and made available within the same system. Such as lower grade results are nevertheless significant to further research, or more technical support for research (e.g., Morphometrics bulletin board) as is typical with newsgroups [Odlyzko, 1995].

Whether such a more general system will lead to change as has occurred in Physics pre-prints will depend on a range of factors such as the significance of early access to results [Abelson 1990 and Foertsch, 1995], the manner in which reviews of such contributions are collected (see [Caplan, 1995] for one suggestion), the ability of individual researchers to apply quality control and the degree to which other qualities of a conventionally published contribution are carried over to the pre-print report. For example, Abelson's comment that authors will be more careful in their claims with a permanent record [Abelson, 1990] could be reproduced when the permanence of a pre-print is similarly ensured, but the 'persuasive completeness' or even the 'aesthetics of writing' for a printed journal version in other disciplines [Burbules and Bruce, 1995] may not.

Whether advantages will further accrue through the development of approaches to assessment of research than are currently achieved through citation analysis, which too can confuse scholarly deference with development of ideas [Budd, 1989] will also only result

6.3.4. Accessing Resources [Atkinson 1996]

The second model to be considered is the conceptualization by Atkinson, of the library as providing a sequence of three linked activities, integrated to provide the best possible, generic access to relevant information sources to researchers.

The first step, though apparently simple, defines the scope of resources that the library should be concerned with. With limited staff resources for provision of services it will never be the case that a library could 'know about' every potential information resource. However, this stage is merely a decision that the library should consider making access to an information source available to the users of the library (although different policies will lead to knowledge about different sets of information sources [Osburn, 1984]).

The second step, an economic one, requires that the library negotiates access, to those that it can afford, in order to be able to provide the resource when required.

The third step is to support the researcher, subjectively, identify and access the most relevant resources from the complete set of accessible resources, using information services which allow appropriate searches to be conducted. Here Atkinson adheres to Lanham's view that the economics of information should be replaced with economics of attention [Lanham, 1993] - that researchers have only a limited time available to search for relevant resources. From this point of view "the function of the service is in fact to intervene in the search process in whatever capacity is required to ensure that the scarce resource of the client-users' attention is put to the best possible use." [Atkinson 1996, p. 246].

The advantage of this model is that it disassociates the function of library from the physical presence - both in terms of the management of paper resources, and also of a specific,

common location. The services can be maintained even where access is achieved by direct downloading from the author, as long as the library has determined that this source of information is one that should be known about. The staged process separates different influences on the decision process, the decision to be concerned with an information resource, from the economic decision to allow access.

This potentially allows the high costs that reflect the "hierarchy of publishing vehicles in all disciplines" [Atkinson 1996, p. 251] to be replaced, or partially supplanted by equivalent journals and services. Here Atkinson raises a similar point to Abelson (see above), in highlighting the benefit to authors in publishing in the top flight journals - it is not just the publishers who benefit from using price to control scarcity. However, here the importance may not reside in a specific information resource, unless that is unique, but rather in the notion of access to equivalent information.

This view clearly supports the new developments in information technology, without wishing to encompass the unconstrained, unstructured openness of the World Wide Web. The first stage of decisions - what should be known about, is clearly one that can be, at the very least, shared with practitioners (see also [Osburn, 1984]). Similarly, with access replacing ownership, the duplication of ownership can be avoided (see also Praeger in [Osburn, 1984] and [White, 1993]). Early investigations by Chrzatowski, also suggest that the transfer of searching from library controlled to individual workstation access for information services does not reduce the quality of information source [Chrzatowski, 1995]. Where the computer interface can be tailored by an individual, the potential to improve on the objective selection process supported by the library with subjective extensions, could provide additional benefits [Stoller, 1992].

Finally, it should be noted that Atkinson's model can be seen as impartial to the nature of knowledge that is maintained about an information source. Whether this is from the conventional OPAC information, existing bibliographic services or an extended information source such as envisaged in Ginsparg's model, the overall importance remains the same - to optimise the selection of appropriate, accessible information by the end user when they need it. Such services are in marked contrast with the current interests of many publishers in linking information sources together [Kahin, 1992].

6.3.5. Evolutionary and Radical Change

The two models above, selected for their potential to describe both current and future systems, afford the potential for evolutionary change and the opportunity for new advances in information technology to be incorporated, wherever that will bring advantage. It offers the potential in which the current increase in scholarly writing can be described, made available and selected because of the information that is made available about each 'contribution'.

More sophisticated description of sources allows the same information services to encompass the full range of educational and scholarly writing. The distinction between them may remain, if different modes of writing are more suitable for different audiences and purposes, or not. The requirement is to support the reader in searching for information sources and not necessarily to maintain traditional distinctions.

Dialogic and mosaic texts can be similarly be incorporated, as can hypertext/hypermedia sources [Atkinson 1993] as well as extensions in visualization and virtual reality [Michelson and Rothenberg, 1992]. However, with new types of resources, their relevance to scholarly publication must also be assessed - for each of the three functions of scholarly communication.

Within the educational system (see previous section) no significant new issues arise and much work has already been done.

As potential contributions to the scholarly record, there is a spectrum of opportunity (e.g., Psycholoquy [Harnad, 1990]). It seems, from the literature, that the changes in communication have produced some advances in research, without necessarily benefiting from the inclusion of such sources within the scholarly record, thus the advance may arise solely from the act of communication, rather than the recording of interaction between the participants. This view retains the concept of research being a process with a start and end point, including circulation of research at various stages of completion [Burbules and Bruce, 1995], but with only the results of research being relevant to the 'critical record'. The other end of the spectrum would view the process of research as being a construction of knowledge - that the distinction in what is communicated between on the way and at the end will not exist. However, to be included, each of these sources must be selectable from, and thus described within [Sweetland, 1992], the same information resources (even if the distinction is still maintained in the description [Glass, 1994]). A key element if this last point is that quality control process must be flexible enough to attribute appropriate significance to each of these new resources. This last aspect will be simpler, and more acceptable in some disciplines rather than others.

The ability and willingness to include such contributions within the scholarly record should cannot be treated as synonymous with willingness of scholars to make such contributions. For this to happen, it must be clear that individuals who contribute are given sufficient recognition within the reward system for academic research [Kahin, 1992]. This will be more challenging than simple inclusion in the 'critical record' for citation. Debate and interactive development of ideas and knowledge requires that the value of a contribution can be apportioned to the participants - but this is not the same as a traditional group that collaborates from start to finish of a project. This represents a significant challenge to the academic establishment, recognising that knowledge results from debate and that it is the negotiation of knowledge which should be rewarded, not the result. Bennet, for example claims "By refocusing our concern, so that scholarly communication embraces not only the formal products of the academic work but also its processes, we have the chance to move from a moribund system to one that fully embraces and facilitates both teaching and research." [Bennett, 1996, p. 194].

It has even been mooted that the Internet, as a common medium of communication, could lead to the elimination of boundaries between disciplines and thus to a merging of methodologies [Henry et al, 1993].

Without concurring with this radical suggestion, the key precursor step that it requires are significant and should be developed where possible.

Firstly, there must be improvements in the interface design to overcome the cognitive difficulties associated with current use of these new resources [Foertsch, 1995]. These changes will occur more rapidly than expected because of the pressure to apply the same concepts in other fields of communication [Sumner and Shum, 1996] and will continue to

evolve (for example - including the ability to personalise and write margin notes on electronic texts or new uses [Burton 1994]).

Secondly it will require further development of descriptive systems and software to support the selection of resources. Current database technology is barely adequate for the task and the solution will probably involve a range of approaches (such as AI belief systems, intelligent agents, pattern matching over sets of resources etc. [Michelson and Rothenberg, 1992], [AAAI, 1996] or greater concentration on what scholars are trying to achieve [Bianchi et al, 1996]). More careful stratification of the selection process (e.g. the Red Sage™ project cited by [Odlyzko, 1995]) will also be beneficial as well as more easy to adopt. Similarly new skills will be needed from the reader's point of view. Different systems for selection, and more integrated meta-data will require change and new forms of serendipity will no doubt evolve.

When more radical change is required, new models of how to value new communications and their authors will need to be developed. This will be discipline based since some disciplines are more able to include such changes than others but whether these changes will be created through subversion or change from the centre of a discipline will depend on the control structure within a discipline at an international level. We should not expect such subversive change; as Odlyzko notes - new start journals are accepted as significant scholarly publications on the reputation of the editor and not the existence of a track record [Odlyzko, 1995]).

7. APPENDICES¹

7.1. FIELD REPORTS FOR CASE STUDIES

7.1.1. JILT

Name of E-Journal:	JILT
URL:	http://elj.warwick.ac.uk/jilt/
Present:	Graham Alsop, Chris Tompsett, Yael Kahn, Nicola Clare, Carol Hall
Interview with JILT Team	19/5/97

1. JILT seen as Better - Provides More

The JILT project views itself as providing a significant advance in the provision of on-line access to electronic information for academic lawyers and others in the profession, published on the WWW.

Content is based on a range of provision. The most significant is access to refereed articles (see below), published on an issues basis (September 1996 and February 1997 were the two current issues) but there was also support for news/announcements, issues pages and links to source materials.

The flow of articles had been slow to start with and now more unsolicited articles were coming in. Although the flow was still not sufficient to be self sustaining it was considered that, just as Sociology On-line believed it was now self-sustaining, JILT would reach the same stage.

It was perceived that a change of presentation of information had influenced a five-fold increase in access between September and February. The September issue had presented the papers as chunks, which required the 'reader' to download the paper a section at a time. The February edition allowed the whole paper to be downloaded as a 'Microsoft Word'.

However it was not clear whether this represented an increase in different readers, or a different perception of the usefulness of the articles or a preference for reading style. Little analysis had been done on readership other than knowing how many 'hits' the site had had.

The other features of JILT were available on a continuous stream basis. The news/announcements page allowed for information about conferences and other events to be made more generally available at a single site.

The issues pages were expected to provide a major opportunity for hypertext, with the potential to discuss articles, with the potential to open up an international community.

¹ Please note addition of *Appendix 7.3.3 Bibliographic References for Indirect Citations* to the original index page of the report.

Source materials were varied in nature. Some were only links with annotations to external sites whilst others were links to mirror sources maintained locally. Content might include software reviews (including demos) and pre-prints as well as any government sources which were relevant.

2. Audience

2.1. Awareness of Audience

As noted above, the project had not tracked access to the journal. It was believed, from a conference at Edinburgh attended by the project that the audience was both academic and professional, including the Judiciary. This conference had been focused on the internet, with papers mainly by academics but a 70%/30% split in attendance with professionals in the majority.

It was felt that bringing people on board to using electronic journals was a slow process which would require additional journals to be available before they were widely accepted (see below).

2.2. Academics

The academic community was principally focused on the preparation of future lawyers, with considerable competition between law schools for placing graduates in top practices. However since law practices was still based on small competitive practices there was a clear separation between the professional practice of law rather than research in the subject.

Research in law was not directly transferred to the profession - academics might give briefings on new issues to professional lawyers but this would not constitute the same work as research. Only a limited number of academics consider research to be part of their work. It was suggested, anecdotally, that the pace of law research was unhurried, with papers written during the summer vacation and research students conducting the literature searches.

Collaborative research in law was limited by the different legal systems that exist (e.g. between English and Scottish law) which also had a significant effect on the nature of international collaboration. The only areas that were available for this latter area, were issues of EU or international collaborations (e.g., EU law, copyright, refugees status) and some aspects of electronic communications (particularly focused on the internet).

Where collaboration did occur it would be within the University if the Law School was sufficiently large to allow two academics to be interested in the same topic.

The audience was believed to be both young and It aware as well as older users who were comfortable with It skills. Most of the IT skills were focused on the World -Wide-Web.

2.2.1. Perceptions of E-Journals

There was a concern, from the JILT team, that the uncertain nature of archived material in an e-journal would be a restriction in uptake.

2.3. Professional Lawyers

From evidence from the conference and electronic mail communication, it was clear that professionals could be any age and that IT skills and use was principally focused on Lexis.

3. Limited Resources

The availability of resources was clearly seen as a barrier to development of JILT. When issues for potential development were discussed, the lack of finance was frequently raised as the problem.

Electronic communications were being used to enhance the review and publication process but it was clear that mailing versions of documents around could be unreliable, particularly if diagrams were included. Hardcopy versions were often sent by post as well as versions being sent via e-mail. Pre-publication versions were available on the Web site for authors for final review.

The maintenance of full citation was considered to be a priority.

4. ELJ Project

The JILT project was viewed as the first step in a wider project of ten different electronic journals.

Much more work was available in the US in Law, but this was perceived to be either electronic versions of existing papers, converted by students in universities, or papers relating to current law cases published by law practices.

Of the existing work On-line Law was considered to be the most advanced in the US.

5. Additional Points

The overall organisation of resources in law was seen as in need of attention. This would address issues such as grouping/duplication of libraries, electronic resources archive with responsibility transferred from the journal to the library and improvements in economy of scale.

6. Wish Lists

When invited to identify the best contributions to the success of the project, Yael suggested that 9 more journals were a critical addition.

Nicola added that instant 'html' markup software that would transform contributions to journal format. More training and the development of a one-stop shop for Law would also be a significant contribution.

Carol suggested that clarification of copyright, a solution to archiving and access to an archive, further promotion of users to use the resources. She also identified the need for a cultural change in time, commitment and collaboration.

7.1.2. CLIC

Name of E-Journal:	CLIC
URL:	http://www.ch.ic.ac.uk/clic/
Present:	Graham Alsop, Chris Tompsett and James Wisdom
Interview with Henry Rzepa at Imperial College	21/4/97

The discussion focused on two questions:

**How did Chemistry academics do research prior to the birth of ejournals?
What has changed with the evolvement of ejournals?**

The Popularity of Macs and associated software.

Computational Chemists have now moved into the mainstream. This was aided by the convergence of the Mac and internet technology in 1986 resulting in the provision of network-ready Macs (at the cost of £4k each - very expensive in comparison with today's prices). By 1990 most of the department at Imperial College were wired up with these machines. The fundamental reason why Macs were popular was the release of a piece of software called Chemistry Office. The adoption of this software spread and became used by the wider community. This enabled Chemists to talk to each other using their own language, often using pictures as well as words. The Chemistry Community has difficulties in expressing itself just using words. In the past molecules were drawn and named. In fact the adoption of visual images to communicate has led to the loss of the skill of using words alone. Now pictures alone are being used instead. The fact is that Chemists can now communicate using **their** language. This is true of both organic and theoretical chemistry. The former uses pictures and iconic images to communicate and the latter mathematics. Both can now use a language which does not rely upon text.

Publishing On Paper

Between 1986 and 1990 most Chemistry publishers required authors to submit camera ready copy for their journals. The format of this copy has similarities to a postscript format, like paper, unchangeable. Chemists can remember using Letraset to achieve this particular outcome. Often no electronic archive was kept by the publishers. However, this position began to change. (Robert Maxwell was also developing his publishing empire at the same time.)

Was writing with paper different?

From 1986 Macs were used to write papers and an electronic archive became easily attainable. Camera ready copy was made without the difficulties of using Letraset. Email was already being extensively used by the mathematicians who were particularly computer-literate. Such developments also led to a growth in the production of collaborative papers. By 1991 exchanging word documents with colleagues was common.

Did the people you collaborated with change?

Yes, since both experimental and theoretical chemists were now using networked machines there was a lot of synergy. The media, email for example, speeded up the communication process. The use of paper mail, however, continued.

Did international communications change?

Imperial already had strong links with Portugal (15-20 years). However, email only came into common use there two years ago. So personal visits and paper mail/fax were used for some time. In general visits are still made once or twice a year. Money has to be found to sponsor the travel necessary to collaborate.

Did the academic/intellectual processes change?

Previously, whoever could put together a first draft did and then put it out to colleagues for comment. Most first drafts need to be about 70% right before engaging in this process. This seems to have continued.

The relationship between images, text and collaboration.

In Chemistry theories are reduced to pictures. 3D images of the movement of electrons are at the centre of discussion. Chemists have been using colour printers for years to project such images. These, however, could not be faxed, but have to be posted, or sent as files to retain their colour. Furthermore, publishers had often passed on the costs of publishing in colour to the author. Anyway this format is still only 2D. Icons and hieroglyphs used to be used prior to colour pictures. This old language has difficulties.

The internet - a collaborative or publishing medium?

In 1992, and the coming of SuperJANET, collaboration continued. Essentially the internet is one large collaboration. A pilot project was undertaken with SuperJANET to see if the language difficulties could be overcome. However, in 1993 it seemed that publishing was the buzz word. Now, in 1997, there has been a return to the buzz of collaboration and now the 3D image can be modelled and shared.

Was it a shared environment to work in?

The concept of collaboration was included at the inception of the CLIC project. Chemistry became a front-runner. Enhanced collaboration was not yet possible or publishable in 3D. CLIC aimed to make this possible. Thus we moved into 3D publishing and retained the collaborative ethos. The prototype was born in October 1994. Initially the papers were refereed electronically. This happened quickly (2 days to referee) and an archive of papers was immediately available.

Does speed change the quality of papers?

Yes, because in addition to the developments came the ability to check the references and primary data. The paper's data could be reconstructed to check the figures. 3D images and maths notebooks can be exchanged and the data enclosed re-entered to be manipulated to test the theories. You can see and evaluate a colleague's work quickly. Our new JTAP project is moving to create the tools to allow this data to be instantly exchangeable without the need for this time consuming re-entry of data.

Sources and databases

There has been a searchable database available since 1984. It contains text and images which can be printed and compared. The difficulty is that the service is very expensive. A pilot project with the suppliers was undertaken to allow unlimited access to the data for a limited period of time. The pilot was not continued because the actual costs of the searching undertaken came to £70,000 whereas the cost paid for the service was only £5,000. Thus the growth of accessing this data has been stifled. Something similar is now available in the BIDS service, but here you cannot search for molecules on-line. One theme of CLIC is to develop expectations that such a reference service for chemists will become available at a cheaper cost. Since 1984 this data has been interpreted from paper and placed into the database. This happens in the USA, where 1500 people are inputting this information. 14 million molecules are known to exist. The most expensive cost is removing errors from the data. This process may be advanced by pattern matching between images and words.

Now in 1997 most journals are available electronically, that is current issues; archives and older issues, however, are often not. The fact is that Chemists often draw upon data which is in excess of 100 years old. Once a molecule is discovered it has a permanent record. In comparison computer science algorithms may only last 4 to 5 years. Industrial chemists need to see whether a molecule has been patented. Hence the importance of access to an up to date database.

Enabling new ideas

There is a need for a current awareness service - a sort of 'molecule of the month' that would spark new research ideas. Some staff do go to the library every Friday afternoon and read through all of the journals to see what is going on. Most ejournals are considering having a free-thought area placed around their ejournal to promote the notions of free-ranging thought and discovery.

Furthermore, more cross discipline collaborations are now beginning. For example, between molecular biology and chemistry. There are, of course, other motivations as well as the media of communication changing, including money for research being available. Both share a common need for an internet authoring design tool - a molecular design tool to aid their research. This area of work is being developed.

Has anything changed in the traditional conference and seminar world?

Our electronic conferences are really awareness raising exercises. An 'e-conference' for the want of a better expression. There is no sign that traditional conferences will cease, despite some of the costs of attending commercial events becoming more prohibitive (£700-800 per day). Our e-conference runs in-between a conventional biannual event. This means that delegates now get information annually and can keep in touch during the lean year. Internet contact is followed up physically the year after.

There are a number of econference models:

1. Abstracts available before a conference on the web

Program available on the web to allow delegates to choose their parallel sessions more easily

Papers available on the web - leads to better discussions at the conference

2. Actual virtual conferences

Conferences are a bit of an entertainment industry! Ejournals and this sort of conference enhancement will meet in the future. However, virtual conferences have problems with time zones, but familiar metaphors like 'ebars', 'emessage boards' etc. are used.

We ordered our papers by which molecules they represented. 1997 will have an e-conference and real conference of 1300 people!

A New Means of Publishing

At the end of most conferences articles are printed into 2D black and white journals. In contrast, our CD-ROM offers a permanent 3D colour model which can be browsed and read. Chemistry Communications subsidised the cost of 5,000 copies (cost was £1 per CD). We found that having an ISBN number was important and archiving the information contained on the CD in chemistry abstracts.

Librarians do have difficulties with the idea of keeping CD-ROMs. These include:

How to loan a CD-ROM?

How to show it?

What to do if deluged by them?

What about the nature of the chemistry communities? How are they set up? How have they changed?

Communities boundaries in Chemistry are set by interest. Boundaries are not defined by seniority in Chemistry. For example, often one has no idea who one is communicating with when using email. Furthermore, some of our most interesting articles come from graduate students. Younger staff and students tend to be more IT literate.

7.1.3. Formations

Name of E-Journal:	Formations
URL:	http://formations.ulst.ac.uk/
Present:	Graham Alsop, James Wisdom, Lynda Henderson, Dan Feming and Fiona O'Brien
Interview with Formations Team	23/5/97

How has access to electronic communications changed practice? i.e. Is there an efficiency gain?

To date we have been concentrating on technical development using a Domino server and Lotus Notes. We believe that we are the first to do this work. We have delivered a trial site which includes a Management discussion database. That is, we are using ourselves to design a full-proof groupware system. The project board is also evaluating this work. Minutes of the advisory group and team meetings are kept on-line.

How do you think academics in the humanities do research?

Science has a history of collaborative work in the discipline. However, in the Humanities individuals tend to undertake research in isolation. We want Formations to lead to a more collaborative way of working, including a sort of peer review. This peer review would be transparent and open, and hold, we believe, a better ethical position.

There will be channels which host topics (called *venues*) for the discussion of subjects e.g. national identity. As the debate 'freezes' (or naturally closes) it will be archived. Each venue will have a host which could be self-selecting. The host will stir the pot to stimulate debate and summarise it at appropriate moments.

To join a channel you must become a subscriber to it. Once you have joined, the host will float topics for discussion, subscribers can comment, submit bibliographies and other resources, offer papers, debate issues etc. At an appropriate time the host will collate a Journal Issue on that topic. The issue would include a selection of material which has been used in the venue. Effectively the area will have been openly peer reviewed. The content of the Journal will not necessarily be primarily text based, unlike traditional linear papers which are presented and then discussed in the next issue in a counter paper. Each host will act in the way that they think is correct for a Channel. We will be briefing hosts.

Is Lotus Notes a barrier to using the site? Does a subscriber have to pay to access it?

No, not any more. Notes works on the web server. It now has good web compatibility. Work made on notes will publish itself - it makes web pages on the fly.

What sort of skills will the average user need?

Basically they need to be able to use a mouse. However, the host will need different skills.

How do you create a community?

How do you turn a reader into a contributor? A venue will email you a summary of the events. The user interface is the same whether you are reading or adding a comment/paper to the journal. So the transformation from reader to contributor should be seamless on the web pages and not require the use of an intermediary email package.

What anecdotal evidence do you have of users' behavioural characteristics?

We have picked people in our project advisory group who are interested in the subject. They are very eager and developmental. Jokes are often made about the inabilities and position of staff, including statements like: 'staff don't have enough time to use this medium, they don't use computers much etc.' Disciplines like history, media and performing arts are subjects which span a spectrum, including areas where staff work on research in isolation and in collaboration. We discovered how our advisory group used the medium.

We used the advisory group to test-bed the development of Formations. The quantity of email in Formations grew quite quickly. We needed to develop a search engine because Lotus Notes, like mailbase, doesn't create intelligent links. The resulting mail threads allow you to get easily lost because message writers were not taking notice of updating the subject heading when replying. The advisory group found 'registering' to use notes on the server confusing.

We wanted to explore problems. For example, email can be very public and can necessitate a quick response unlike writing a letter. Formations uses a submission box. Here text can either be written on line or pasted in from a word processing package. People do work in different ways. Furthermore, some people do not mind having spelling mistakes in email and some do - one of the advantages of Lotus Notes is that it allows you to re-edit your own documents, so you can correct your work.

How do you move people from being readers to writers?

All of our users, the advisory group, know each other. However, we envisage that when people register to use Formations they will offer a brief profile of themselves as an introduction. This will offer some social dimension. It was suggested that we should have a general venue where anybody can talk to anyone. Something like the smoking room or a library.

How do opinions get valued in this medium? You don't quite talk or write with this medium. Email is still being explored as a medium.

We will get Formations rolling by beginning with well regarded contributors. We are compiling a dynamic living dictionary. This will be fun and useful and should bring both quick and good results. We are going to choose people eminent in their field to introduce terms. This should mark the cultural shifting. Besides, the process of collaborating might not create a finished product.

There is a collaborative model of working implicit in the Channels. The question is how to develop the culture of collaboration. The web can act as an agent to bring life to old material. People will post whole papers which are difficult to read on-line. We will just have to let this happen. On the other hand people might just debate over points of arguments.

Is the existing culture of collaboration or competitiveness? Does a community exist in cultural studies who will contribute? Do they know each other?

We will begin by drawing on the existing community through issues which are of interest to them, national identity, for example. We will be actively recruiting them to 'prime the pump' and this should lead to discussion through the openness of the medium. Creating a community might need a handshaking process, perhaps ensured by the host.

The Culture of the Humanities

The Humanities have used on-line resources for some time, access to which has become even easier with the world wide web. However, this has led to inflated expectations. There has also been hype as regards on-line working. Publishing on the web has led to a return to collaboration. Previous publishing models do influence the new.

Draft papers are often circulated privately for comment where the focus is on an end product. In essence do you write for yourself or for other people? We think that discourse is the culture of the humanities. Monographs are the expressions of previous collaborative work. The web allows a multiplicity of conventions to exist. The medium really is flexible.

Research Assessment Exercise

Much concern was expressed regarding the RAE and the WWW. Concern was also expressed regarding cataloguing, ordering and archiving email. Practice is changing and staff are publishing on line now as well as in paper journals.

Information Seeking

There is probably still some way to go with search engines ('scatter gather work' - using some intelligent reclassifying until a precise clustering is presented).

Training

Many staff don't know how things work on the WWW - training is needed. Academics have different qualities to computing staff. They often want help in the department on a need to know basis. Some social fabric is needed around the technology. The hardware and software is getting friendlier, but the software still assumes knowledge of caching etc. This can lead to complications. The next generation will no doubt have overcome many of these difficulties!

7.2. FIELD REPORTS FOR CONSULTATION

7.2.1. Lawyers

Law Consultation Event
20th June 1997
The Library Association

What follows is an account of a meeting held at the Library Association on the 20th June 1997 for a supporting study entitled 'A Study Human Communication Issues In Interactive Scholarly Electronic Journals' undertaken for the Electronic Libraries initiative funded by the Joint Information Systems Committee. Representatives from 8 institutions attended. The discussion centred around the following questions:

**What difference has electronic communication made?
What difference do you think electronic communication will make?**

Models of Change

One model of change cited was a Head of School insisting on staff using email. Staff were seen to become more interested in email when they found they could speak to people outside the institution. The period of change took about 18 months and this was reliant upon a Head of School supporting the change.

It was noted that you can make people aware of what is there, but you can't make them use it.

Email

Staff had many anecdotes about people not reading email. This meant that they could not rely on using email. For example setting up a meeting using email was impossible. This, however, was thought to depend on the culture in a particular institution. It was reported that some staff did not have enough time to join the mailing lists and communicate with the outside world. Many did, however, use the medium internally to communicate within their institution.

It was commented that there was a low rate of interaction on the UK law lists. There is a lot more interaction on U.S. lists.

Judges were known to communicate by e-mail which for them is a new way of working. Over half of the judiciary are email users. They hold closed conferences to discuss new legislation and to disseminate Court of Appeal decisions quickly. Additionally, they have on-line access to the Supreme Court Library, Lexis and other legal databases. The Independent Tribunal Service was identified as implementing a successful top-down model of change to using email.

One delegate stated: "I use email to do collaborative research and much of my work - IT law - means I must keep up to date. I'm on lists where you can get very up to date information - recent judgements etc. Electronic resources are part of what to do. Its a matter of 'which lists should I be on' rather than 'should I be on the lists'".

There was thought to be a need for actively managed lists. Interaction was seen to be possible but does not necessarily happen. Not many lists were known to have much traffic - very few small lists have much traffic. UK lists, generalising, tend to disseminate, whereas US lists tend to be far more noisy.

Academics were more interested in discussion, rather than information gathering. Practitioners tend to look for answers to particular questions on email lists.

Email was thought to produce more collaborative work.

How 'Connected' is the Law Community?

How many computers are there around the law world? The old university sector was thought to be better 'wired up' - perhaps 90% of staff had desktop access to the internet.

Teaching or Research?

Do you see yourself mainly as a teachers or as a researchers? It was seen to be essential to use the web if you are a researcher and research was thought to be important in informing teaching.

The Culture of Law and Teaching and Research

Law was not identified as a subject which, within itself, has a culture of sharing when compared to other areas. However, cross discipline work implied collaboration between subjects.

World Wide Web Publishing

It was suggested that the medium had shown that it was quicker to publish a paper electronically than on paper. This made it easier to publish overseas.

Models of Working

An example of the paperless office was offered where: all material can be scanned and converted to text; all data pressed onto a bootable CD; all staff can carry a CD full of data; mobile equipment is available (including laptops, printers and projectors); modem links to the office allow access to all materials; academics can work from home. This office is funded by the income from 2 postgraduate distance learning courses. All of the text created for these courses is protected by copyright.

Is this work course management or or teaching and learning centred ?

A customer-based service is offered - a one-stop shop. Assessment is by 5 assignments and a dissertation. The teaching staff are being educated in IT. Dictation down the phone has been experimented with, but the voice recognition software is not quite good enough yet. You have to talk very slowly in a 'robot' like tone.

Teaching and Research

It was thought that one of the major teaching and learning problems in law is the need to access a large number of resources e.g. case studies. LEXIS and LAWTEL searches were not identified as difficult to learn.

As regards the library, law researchers were thought to have a better grasp of available resources. Researchers tend to keep librarians up to date in which resources they should be looking toward. It was commented that some Chambers are ahead of the game with IT, but some are still living in the 'dark ages'.

What is a law researcher? Delegates were referring to academics doing research for chambers, some teaching staff and students.

Collaboration in Law

What about collaboration? What do you see taking place?

Intranets were known to be already well established and used in the practice law field. JILT was thought to be used heavily by commercial lawyers, but some of these could be academics using a non-academic service provider.

At the end of the meeting delegates were asked to make a wish list for the future:

- more equipment and training - some non-number crunching social science disciplines have a need for resources.

- look towards economies of scale e.g. case studies of HRM law available across the sector - Money to provide appropriate database sets on a non-commercial basis, e.g. statutes, tribunal reports etc.

- academics be encouraged to use the internet

- offer subject customised screens in departments, e.g. a law 'window', identifying key resources

- modems at home would allow staff to browse the WWW without the pressures of time and discover what they would find useful

- need an IT literate (or even a hybrid IT/Law/Librarian) colleague down the hall to help staff locally

Thank you to Andrew Charlesworth and Peter Hardie-Bick for comments on a draft of this document.

7.2.2. Chemists

Chemistry Consultation Event
24th June 1997
The Library Association

What follows is an account of a meeting held at the Library Association on the 24th June 1997 for a supporting study entitled 'A Study Human Communication Issues In Interactive Scholarly Electronic Journals' undertaken for the Electronic Libraries initiative funded by the Joint Information Systems Committee. Representatives from 7 institutions attended. The discussion centred around the following questions:

**What difference has electronic communication made?
What difference do you think electronic communication will make?**

The Culture of Chemistry

Local staff attitudes were thought to be an important factor. One delegate found that 20-30% of staff at their institution were keen to be involved in internet work and resources while the remainder were 'dragged along' or uninterested. Email was seen to have been accepted. Organic chemists were identified as being more open to these ideas than other chemists. Recent IT developments were viewed as 'revolutionising' organic chemistry. These had enabled such chemists to draw structures as opposed to just communicating using text, numbers and 2 dimensional (2D) pictures. Without doubt the medium was also seen to have changed the way courses are administered and this was identified as having had the greatest impact. A few people were known to be using the web to put up lecture notes.

The Languages of Communication

The ability to communicate in 3 dimensions (3D) had only become cost free during the last year. It was reported that the pharmaceutical industry needed to develop this capability and decided to pass it on to the academic community. It was thought that deeper changes had occurred as a result to organic chemistry than to pharmacy. Organic chemists, unlike physical chemists, were seen as 'exchangers and developers' of ideas. It was perceived that they think and work in different ways. Physical chemists were characterised as those who 'look for the proof first'. It was not that the case physical chemists were not seen to be collaborative, they were collaborative, but their major IT development came with spreadsheets. These allowed them to search systematically for compounds.

Computational chemistry had also changed. There was now a role for the practical programme and not just pure theory anymore. They were now interested in molecular modelling and were used to working in 3D.

Information Seeking

It was known that organic chemists could now search for a picture, a name fragment or a molecular formula even when they did not know what the structure is. They were also known to be able to search for a shape. This was possible back in 1984, but it was both expensive and tiresomely slow.

Delegates noted that librarians used to control such searches for academics and that they were often accused of bad searches, but this was seen to be unavoidable.

The ability to search for sub-structures (not previously possible) was identified as a new development. This was thought to give staff more confidence in the results of searches than before. In general all believed that there was better access to similarity matching now.

Relationships between the Library, Academic Research and On-line Resources

It was stated that before organic chemists publish they have to know about anything which has been published before on the subject: this includes whatever has been published in Chemistry Abstracts.

Have the social and bureaucratic structures changed?

Generally librarians were no longer seen as intermediaries, but because substructure searching is expensive at \$120 per search, and some academic staff were known to have direct access to this, librarians were sometimes acting as gatekeepers to monitor the costs.

Some academics seem to be more comfortable with paper. They were thought to miss the serendipity of browsing when searching on the web. You cannot flick through the contents pages of journals, or just scan the pages. Many libraries were known to be canceling Current Contents. Fears were expressed that this might lead to fewer research ideas for those who like using paper.

It was recognised that there are ways of having contents pages sent to you via the WWW. BIDS can do this, for example.

Generally it was thought that those staff with dedicated PCs would use such resources, but those sharing would probably use the library as their first port of call. It was noted that searching facilities also change relatively rapidly and there is no doubt a role for Library staff continually to update academic staff's skills. One of the most important elements was identified as staff development and encouraging staff to use the WWW. This also presented difficulties because much information is transient and is sometimes only available for trial periods.

Higher Education Administration

It was thought that administration had been revolutionised by IT. Most universities were reported as having an IT strategy in place. In research IT was cited as having proved its role. However, it was felt that with regard to teaching and learning the role was still uncertain.

Email

What are the shapes of relationships in organic chemistry with regard to the role of email? Do you feel as if you are part of a world-wide community? Have you joined email groups? Do you browse randomly at archives?

All said that they had used newsgroups and email, but all preferred email. Newsgroups were only found to be useful when trying to find out where a list or information was, for example, what email lists were available on a subject. All thought that there was an issue of quality on the internet. In some ways the internet was seen to be a solution looking for a problem. Delegates said that it was necessary to ensure that the question being put is relevant to the recipient. It was untargeted questions which were found to cause difficulties and generally it was the volume of these which was found irritating. There was some software known which was available to help with this. It creates profiles of the user and goes to get relevant information. Presently though there was known to be a cataloguing problem. The meta-data was not yet in place to ensure that such software could work well. Besides, a control vocabulary was thought necessary. Such meta-data could then even be placed in email messages.

Can you get the wealth of good ideas without the 'noise' of email lists and newsgroups?

Collaboration as a Result of Using the Internet

Is email changing academic work?

The internet and collaborative work were cited as the 'flavour of the month'. Attendees found it easier to develop closer links with colleagues nearby and far away. It was also easier for staff to see who is using their materials. Writing collaborative papers over large geographical distances was also seen as easier and articles were thought to be better and more polished as a result of this. Furthermore, some WP packages were known to pick up what has changed in a new version of a document. Paper annotation was, unfortunately, not available yet, but all looked forward to it. People's experiences of the use of groupware were not all positive. Its use could lead to difficulties over who owned the initial idea. Journals were seen to be changing the way staff work. Often referees' comments were known to lead to a reworked article. In effect proto-papers were being submitted.

An example of collaborative working to develop validation documents was offered. It allowed the documents to be written quickly, but the quality was lacking. There was little control over the changes made and the process of editing.

Research Assessment Exercise (RAE)

Is submitting to an ejournal the same as a journal?

The RAE was supposed to view TLTP as research, but no-one knew of it being identified as such. It was thought that the criterion used was that the ejournal had to be found in the top 3,000 journals found in the relevant citation index for the subject. Furthermore, questions were raised as to how to reference a comment in a discussion list. It was felt that this should only be viewed as personal communication.

Attendees had submitted papers and posters to 2 of the chemistry conferences associated with CLIC. At one of these events a paper generated 500 pieces of correspondence! These papers were refereed and placed on a CDROM with an ISSN. However, none of these counted towards the RAE.

Do you publish electronically if your endeavour is not recognised in the RAE, even if the best medium for your work is the WWW (i.e. it allows 3D images to be published)?

All felt that you would have to publish in both paper and on the WWW to cover all 'bets'. Furthermore, a hierarchy of journals was identified. It was thought that any new journal or ejournal would need to climb this ladder to gain respect. Finally, there was a difficulty noted with following up WWW and CD-ROM references. Delegates were concerned as to whether all CDROM and WWW resources would still be available in the future and how transient different media and file formats might be.

Parallel publishing was deemed a way forward.

The language of HE was identified to be one of tenure! Staff were seen to publish in the highest impact journals when possible. These were thought to reinforce existing ideologies and philosophies.

Ejournals were seen to offer fast feedback on articles.

Technical Issues and Training

All thought that hardware was not a barrier to development. MAN video conferencing and other developments were seen to be achievable. As for staff development, it was suggested that there may be a need for some re-education, but most new staff were seen to be coping. There was, however, a 'skills gap' identified.

Teaching and Learning

Delegates have heard that students are pushing staff to use IT. For example, they are asking for lecture notes and past exam papers to be placed on the WWW. However, staff had met resistance against these moves from students. This was thought to be common for courses supporting large cohorts of students where they miss the human contact or perhaps lack sufficient access to IT.

Working From Home

Would modems and PCs at home help staff to work?

This raised the question: 'should you be on campus to help your students?'

It was thought that part-time staff presented a different case. Delegates cited examples of part-time staff being forced to have modems to allow students to have easier access to them. After all, there is a high percentage of part-time staff delivering HE courses. An example was given of medical staff using modems to support tutorial work with medical students who don't

meet together very regularly. It was recognised that such part-time staff would probably need to be paid more as a result of these developments. It was a well known fact that the TQA exercise had widely criticised universities over the levels of support for part-time staff.

Student Access to Information Technology

Many student halls and university flats were known to be being cabled up for WWW access. Kings' College, for example, were offering dumb terminals to Masters students. The Open University, and many Multimedia courses at a number of institutions, were also cited as trying to place ownership of a PC as an entry requirement to courses.

Many thanks to Dr. Bernard Blessington for comments on an earlier draft of this document.

7.2.3. Cultural Studies

Cultural Studies Consultation Event
20th June 1997
The Library Association

What follows is an account of a meeting held at the Library Association on the 20th June 1997 for a supporting study entitled 'A Study Human Communication Issues In Interactive Scholarly Electronic Journals' undertaken for the Electronic Libraries initiative funded by the Joint Informations Systems Committee. Representatives from 15 institutions attended. The discussion centred around the following questions:

**What difference has electronic communication made?
What difference do you think electronic communication will make?**

Cultural Studies and Information Technology

It was thought there had been less progress in using electronic communication in the humanities than other disciplines. Delegates suggested that there were fewer identifiable financial incentives to use Information Technology (IT) in cultural studies than in Science and Technology, where the speed of communication of good research can lead to funding opportunities. In general, information in Science was thought to have greater commercial value. Electronic communication, however, is becoming increasingly possible in the humanities because the discipline is becoming more 'wired up' and better supplied with hardware. Attendees thought Cultural Studies to be an area of information technology 'have nots' as opposed to 'haves'. Wishes for more 'pump priming' funding to change this situation were expressed.

The Value of World Wide Web (WWW) Material

It was noted that there was greater access now than previously to materials via the WWW for students, researchers and academics. It was also recognised that it was increasingly possible to customise material and software to individual's research and teaching needs. However, concerns were expressed regarding how to deal with the vast volume of rubbish on the WWW.

Information Seeking

Identifying the correct keywords for a search on the WWW was seen as more important than identifying terms for systems like LIBERTAS. It was also commented that keyword searching can limit an inquiry.

Information was seen to be constantly on the move on the WWW. Many found that Web pages do not often have dates on them. It was thought that this should be mandatory. It was commented that new and changing research skills are needed to extract material from Web.

Do people use search engines for research?

Delegates noted that search engines will go through and search everything on the Web. It is possible to stop the robots going through your server.

Staff wished to build their own journals of material from different web sources. Links were seen as enabling users to create their own narratives. One is not restricted by the linear shape of a book.

It was stated that people do not 'peer over the fence' at other disciplines materials partly because of the way in which search engines allow you to focus on very specific subject areas. Many said at first that they spent hours surfing the web and exploring the possibilities, but this was found to be very time consuming. Eventually you become ruthless and learn to focus. However, it was noted that this focussing means that you lose the serendipity of the medium.

Delegates thought that the Net is getting beyond control and that it could be valuable to identify areas where clusters of material are developing.

Concerns were expressed regarding how to archive material on the web. Paper was still seen to be a better method of preservation.

Email

Email was thought to be 'breaking' traditional discourse. It was noted as being more chatty and allowing different levels of discourse both formal and informal to occur. It was also identified as a communication medium which makes international contacts easier to get and to develop. Furthermore, individuals were known to have 'made friends' prior to attending conferences in different countries. The medium had accelerated the development of such relationships. Email was also thought to have presented colleagues with new possibilities in co-authoring articles.

Email was cited as creating new communities. For example, you can work/conference from home. Delegates noted that they "would not be here [at the consultation event] if it wasn't for e-mail". It was questioned as to whether the quality of discussion which was taking place [today] could have been achieved through email.

Many found the management of their daily email messages very time consuming.

Mailing lists were thought to have negative aspects, for example they sometimes get 'angry'. It was at these times that they were often seen to redefine themselves.

Coping with large quantities of email was seen to be a difficulty - if everybody consults the expert then the expert gets swamped. It might be sensible to have one public and one private e-mail address - like Bill Gates.

Ownership of Knowledge

A problem of plagiarism was identified and noted as being an issue regarding students' work.

Research Assessment Exercise

It was thought that the Research Assessment Exercise prevented the full exploitation of the medium.

All were concerned that the next Research Assessment Exercise might either ignore or be destroyed by the Web.

World Wide Web Pages

Attendees thought that very little material published on the web was written with the web in mind. Writing for the web was said to require a different set of skills to writing on paper. These included: writing for a screen, text which was more question driven, and including links. Meta-tags were also seen as a way of steering people towards a page. Web material was currently thought still to be written in a very traditional paper-based format.

In Cultural Studies, a lot of material is text based. How do you condense the material for it to be screen readable? Do you turn a document into text or a facsimile? If you can, do you create both text and facsimile?

It was thought that the personal imprint on documents is being lost. However, it was commented that scanners and software now made electronic copies including such imprints possible.

Plug ins, in general, were deemed to make documents more difficult to access.

Attendees felt they were still trapped in a paper culture. Electronic journals/ magazines were not the same as paper equivalents but they are still imitating them. "Take away the staple and you don't have a physical object".

Paper journals were still thought to be necessary. People like to have something they recognise. It was noted that the way some arguments are constructed relies on the medium of print.

Technical Issues

'Bandwidth' was noted as a problem. Many found themselves waiting a long time for pages to download and experienced much frustration. This was particularly true when downloading a lot of pictorial material. It is easier to retrieve text.

It was mentioned that large files can be transferred via satellite links, if you have the dish. This was seen as quick and avoiding delays. It was thought that this might be standard technology in 2 years time.

Cultural Studies and IT

Cultural Studies was identified as being behind other areas in exploiting the WWW. The Web was thought clearly to be a post-modern medium. Thus it was suggested that there was no reason why people in Cultural Studies should not feel comfortable with it. Only the technological barriers were seen as necessary to overcome.

Training

Does Information technology create a need for training? The technology was cited as easy to use - once you know how to do it. Furthermore, it was commented that there are different levels of e-mail skill - some people communicate much better than others.

WWW Culture

All found there to be a great willingness to help and answer questions on the Net. This also seemed to hold true in University computer rooms. 'Helpfulness' seems to be a part of the culture.

It was recognised that the availability of free materials is part of the ethos of the web. This creates problems in asking for money for e-journals. A way forward was seen to be perhaps through a learned society - if you join the society you can access the journal.

One suggestion was to regulate access to different areas of the web. But it was also thought to be a worrying development if, for example, only medics could read medical journals. It was thought to be positive that anybody at present can go into their library and read anything.

The great benefit of the web was identified to be the exchange of material without charging. It was pondered as to why publishers are not thinking in more commercial terms about the Web.

7.3. BIBLIOGRAPHY

7.3.1. Bibliography of Articles Read

AAAI (1996), The Role of Intelligent Systems in the National Information Infrastructure, Weld, D. S. (ed.), [on-line :<http://aaai.org/Policy/Papers/nii.html>, this version last updated 15.10.96]

Abelson, Philip (1990), (American Association for the Advancement of Science). Mechanisms for Evaluating Scientific Information and the Role of Peer Review. *Journal of the American Society for Information Science.* ; 41(3).

Albtach (1989), see: [Shaughnessy, Thomas W.; And Others].

Atkinson, Ross, (1993) Library Functions, Scholarly Communication, And The Foundation Of The Digital Library - Laying Claim To The Control Zone. *Library Quarterly.* 1996; 66(3): 239-265; ISSN: 0024-2519.

Atkinson, Ross, (1996) Networks, Hypertext, And Academic Information-Services - Some Longer- Range Implications. *College & Research Libraries.* ; 54(3): 199-215; ISSN: 0010-0870.

Bailey, C. W. Jnr., (1997) Scholarly Electronic Publishing Bibliography Version 6 3/19/97 6 [On-line: <http://info.lib.uh.edu/sepb/sepb.pdf>]

Becher, T. (1994). The Significance Of Disciplinary Differences. *Studies In Higher Education.* 1994; 19(2): 151-161; ISSN: 0307-5079.

Bennett, S. (1996). Reengineering Scholarly Communication - Thoughts Addressed To Authors. *Journal Of Scholarly Publishing.* 1996; 27(4): 185-196; ISSN: 1198-9742.

Berge, Z. L.; Collins, M. (1995). Computer-Mediated Scholarly Discussion Groups. *Computers & Education.* 1995; 24(3): 183-189; ISSN: 0360-1315.

Bianchi, Nadia; And Others. (1996) Multimedia Document Management: An Anthropocentric Approach. *Information Processing & Management.* 1996 May; 32(3): 287-304; ISSN: 0306-4573.

Bieber, Jeffery P.; Blackburn, Robert T. (1993) Faculty Research Productivity 1972-1988: Development and Application of Constant Units of Measure. *Research in Higher Education.* 1993 Oct; 34(5): 551-67; ISSN: 0361-0365.

Boguski, M. S. (1995). Adventures In Information Space - Biomedical Discoveries In A Molecular Sequence Milieu. *Serials Librarian.* 1995; 25(3-4): 125-131; ISSN: 0361-526X.

Budd, John M.(1989), Information Transfer and Scholarship: The Impact of the Peters and Ceci Paper. [Journal Article (080). Research Report (143)]. *Library and Information Science Research.* 1989 Oct; 11(4): 357-68.

Burbules, Nicholas C.; Bruce, Bertram C. (1995) This Is Not a Paper. *Educational Researcher.* 1995 Nov; 24(8): 12-18; ISSN: 0013-189X.

- Burton, Paul F. (1994), Electronic Mail as an Academic Discussion Forum. *Journal of Documentation*. 1994 Jun; 50(2): 99-110; ISSN: 0022-0418.
- Caplan, P., (1995) "You call it Corn, We call it Syntax-Independent Metadata for Document-like Objects *The Public-Access Computer Systems Review* 6(4)
- Carland, J. A.; Carland, J. W.; Aby, C. D. (1992). Proposed Codification Of Ethicacy In The Publication Process. *Journal Of Business Ethics*. 1992; 11(2): 95-104; ISSN: 0167-4544.
- Chrzastowski, T. E. (1995). Do Workstations Work Too Well - An Investigation Into Library Workstation Popularity And The Principle Of Least Effort. *Journal Of The American Society For Information Science*. 1995; 46(8): 638-641; ISSN: 0002-8231.
- Clemens, Elisabeth S.; And Others. (1995) Careers in Print: Books, Journals, and Scholarly Reputations. Centennial Essay. *American Journal of Sociology*. 1995 Sep; 101(2): 433-94; ISSN: 0002-9602.
- Ellis, David; And Others. (1993) A Comparison of the Information Seeking Patterns of Researchers in the Physical and Social Sciences. *Journal of Documentation*. 1993 Dec; 49(4): 356-69; ISSN: 0022-0418.
- Ercegovac, Zorana.(1992) Environmental Research: Communication Studies and Information Sources. *Annual Review of Information Science and Technology (ARIST)*, ^v27 p173-225. 1992; ; ISSN: 0066-4200.
- Foertsch, Julie (1995). The Impact Of Electronic Networks On Scholarly Communication - Avenues For Research. *Discourse Processes*. 1995; 19(2): 301-328; ISSN: 0163-853X.
- Geldenhuys, Gerhard; Human, Lezanne. (1996) Comparison of Two Indices for the Investigation of Cooperation Graphs. *Journal of the American Society for Information Science*. 1996 May; 47(5): 380-84; ISSN: 0002-8231.
- Ginsparg, P (1996) Winners and Losers in the Global Research Village, invited contribution for UNESCO Conference, Paris 19-23 Feb 1996 [on-line: <http://xxx.lanl.gov/blurb/pg96unesco.html>].
- Glass, G., (1994), School choice: A discussion with Herbert Gintis, *Educational Policy Analysis Archives*, 2 [On-line: <http://www.asu.edu:80/asu-cwis/spaa/v2n6.html>]
- Harnad, S. (1990) Scholarly Skywriting and the Prepublication Continuum of Scientific Inquiry, *Psychological Science* 1:342-343
- Harnad, S. (1995) Implementing Peer Review on the Net: Scientific Quality Control in Scholarly Electronic Journals. In: Peek, R. & Newby, G. (Eds.) *Electronic Publishing Confronts Academia: The Agenda for the Year 2000*. Cambridge MA: MIT Press.
- Harrison, T. M.; Stephen, T. (1992). Online Disciplines - Computer-Mediated Scholarship In The Humanities And Social-Sciences. *Computers And The Humanities*. 1992; 26(3): 181-193; ISSN: 0010-4817.

- Henry, Charles; And Others. (1993) The Impact of Networks on Information Transfer. *Bulletin of the American Society for Information Science*. 1993 Feb; 19(3): 16-22; ISSN: 0095-4403.
- Jones, M. J.; Brinn, T.; Pendlebury, M. (1996). *Journal Evaluation Methodologies - A Balanced Response*. *Omega-International Journal Of Management Science*. 1996; 24(5): 607-612; ISSN: 0305-0483.
- Kahin, Brian. (1992) *Scholarly Communication in the Network Environment: Issues of Principle, Policy and Practice*. *Electronic Library*. 1992 Oct; 10(5): 275-86; ISSN: 0264-0473.
- King R. and Covi, L., (1995), *Electronic journals and Legitimate Media in the Systems of Scholarly Communication*, *The Information Society*, 11(4): 261-271
- Lamb, R., (1997), *After Scholarship: Making Informatin Actionable*, [on-line: <http://www.ics.uci.edu/~rlamb/scom1.html>]
- Lewis, David L. (1988) *Inventing the Electronic University*. *College and Research Libraries*. 1988 Jul; 49(4): 291-304.
- Lindholmromantschuk, Y.; Warner, J. (1996). *The Role Of Monographs In Scholarly Communication - An Empirical- Study Of Philosophy, Sociology And Economics*. *Journal Of Documentation*. 1996; 52(4): 389-404; ISSN: 0022-0418.
- Logan, Elizabeth L.; Pao, Miranda Lee. (I1991), *Identification of Key Authors in a Collaborative Network*. *Proceedings of the ASIS Annual Meeting*, ^v28 p261-66. 1991; ; ISSN: 0044-7870.
- Mcdonald, S.; Feather, J. (1995). *British-Library And Information-Science Journals - A Study Of Quality-Control*. *Journal Of Information Science*. 1995; 21(5): 359-369; ISSN: 0165-5515.
- Michelson, Avra; Rothenberg, Jeff (1992). *Scholarly Communication and Information Technology: Exploring the Impact of Changes in the Research Process on Archives*. *Rand Reprints*. [Evaluative Report (142). *Journal Article* (080)]. *American Archivist*. 1992; 55(2): 236-315.
- Moran, G.; Mallory, M. (1991). *Some Ethical Considerations Regarding Scholarly Communication*. *Library Trends*. 1991; 40(2): 338-356; ISSN: 0024-2594.
- O'Haver, Thomas C. (1995) *CHEMCONF: An Experiment in International Online Conferencing*. [Project Description (141). *Journal Article* (080)]. *Journal of the American Society for Information Science*. 1995 Sep; 46(8): 611-13; ISSN: 0002-8231.
- Odlyzko, A. M. (1995) *Tragic Loss Or Good Riddance - The Impending Demise Of Traditional Scholarly Journals*. *International Journal Of Human-Computer Studies*. 1995; 42(1): 71-122; ISSN: 1071-5819.
- Osburn, Charles B. (1984) *Issues of Structure and Control in the Scholarly Communication System*. *Library Quarterly*. 1984 Jan; 54(1): 81-93.

Philip, G. (1995) Use Of Leading-Edge Information-Systems By Academic Chemists In The Uk .1. The Results Of A Preliminary Investigation. *Journal Of Information Science*. 1995; 21(3): 187-199; ISSN: 0165-5515.

Philip, G. (1996) Use Of Leading-Edge Information-Systems By Academic Chemists In The Uk .2. Constraints And The Need For Usability Engineering. *Journal Of Information Science*. 1996; 22(2): 93-106; ISSN: 0165-5515.

Popkin, R. H. (1990) The Scholarly Communication Process In The Humanities - The Role Of The Editor. *Serials Librarian*. 1990; 17(3-4): 25-32.

Rolinson, J.; And Others. (1995) Use of Information Technology by Biological Researchers. *Journal of Information Science*, v21 n2 p133-39. 1995; ; ISSN: 0165-5515.

Schwartz, Charles A. (1994) The Strength Of Weak Ties In Electronic Development Of The Scholarly Communication-System. *College & Research Libraries*. 1994; 55(6): 529-540; ISSN: 0010-0870.

Shaughnessy, Thomas W.; And Others. (1989) Scholarly Communication: The Need for an Agenda for Action--A Symposium. *Journal of Academic Librarianship*. 1989 May; 15(2): 68-78.

Shreeves, Edward (1992) Between The Visionaries And The Luddites - Collection Development And Electronic Resources In The Humanities *Library Trends*. 1992; 40(4): 579-595; ISSN: 0024-2594.

Stoller, Michael E. (1992) Electronic Journals In The Humanities - A Survey And Critique. *Library Trends*. 1992; 40(4): 647-666; ISSN: 0024-2594.

Straub, D. W.; Ang, S.; Evaristo, R. (1994) Normative Standards For Is Research. *Data Base*. 1994; 25(1): 21-34; ISSN: 0095-0033.

Sumner, T. and Shum, S. T., (1996), Open Peer Review & Argumentation, Loosening the Paper Chains on Journals, *Ariadne* 5, 1996

Sweetland, James H. (1992) Humanists, Libraries, Electronic Publishing, and the Future. *Library Trends*. 1992 Mar; 40(4): 781-803; ISSN: 0024-2594.

White, H.(1993) Scholarly Publication, Academic-Libraries, And The Assumption That These Processes Are Really Under Management Control. *College & Research Libraries*. 1993; 54(4): 293-301; ISSN: 0010-0870.

Addendum References

Harter, Stephen P. (1994), "The Impact of Electronic Journals on Scholarly Communication: A Citation Analysis." *The Public-Access Computer Systems Review* 7, no. 5 (1996): 5-34.
HTML: <URL:http://info.lib.uh.edu/pr/v7/n5/hart7n5.html>. ASCII:
<URL:http://info.lib.uh.edu/pr/v7/n5/harter.7n5>.

Harsanyi, Martha A. (1993) Multiple Authors, Multiple Problems--Bibliometrics and the Study of Scholarly Collaboration: A Literature Review. *Library and Information Science Research*. Sep; 15(4): 325-54; ISSN: 0740-8188.

7.3.2 Extended Bibliography

Amiran, E., and Unsworth, J., (1991), "Postmodern Culture: Publishing in the Electronic Medium." *The Public-Access Computer Systems Review* 2, no. 1 (1991): 67-76. ASCII file: <URL:<http://info.lib.uh.edu/pr/v2/n1/amiran.2n1>>. *Postmodern Culture*: <URL:<http://jefferson.village.virginia.edu/pmc/contents.all.html>>.

Andrews, K., and Dieberger, A., (1996), Reinventing the Wheels...? Usability problems on the World-Wide Web.[http://www.gatech.edu/faculty/dieberger/Usability_and_Web.html]

Arms, William Y., Christophe Blanchi, Edward A. Overly. (1997), "An Architecture for Information in Digital Libraries." *D-Lib Magazine* (February 1997). HTML file: <URL:<http://www.dlib.org/dlib/february97/cnri/02arms1.html>>.

Arnold, Kenneth. (1993), "The Scholarly Monograph is Dead. Long Live the Scholarly Monograph." In *Scholarly Publishing on the Electronic Networks: The New Generation: Visions and Opportunities in Not-for-Profit Publishing: Proceedings of the Second Symposium*, ed. Ann Okerson, 73-79. Washington, DC: Office of Scientific and Academic Publishing, Association of Research Libraries, HTML file: <URL:<http://arl.cni.org/scomm/symp2/Arnold.html>>.

Atkins, Daniel E., William P. Birmingham, Edmund H. Durfee, Eric J. Glover, Tracy Mullen, Elke A. Rundensteiner, Elliot Soloway, Jose M. Vidal, Raven Wallace, and Michael P. Wellman. (1996), "Toward Inquiry-Based Education Through Interacting Software Agents." *Computer* 29 (May 1996): 69-76. HTML file: <URL:<http://www.computer.org/pubs/computer/dli/r50069/r50069.htm>>. University of Michigan Digital Library Project: <URL:<http://www.sils.umich.edu/UMDL/HomePage.html>>.

Atkinson, Roderick D., and Laurie E. S., (1995), "TORPEDO: Networked Access to Full-Text and Page-Image Representations of Physics Journals and Technical Reports." *The Public-Access Computer Systems Review* 6, no. 3 (1995): 6-15. HTML file: <URL:<http://info.lib.uh.edu/pr/v6/n3/atki6n3.html>>. ASCII file: <URL:<http://info.lib.uh.edu/pr/v6/n3/atkinson.6n3>>.

AUCC-CARL/ABRC Tak Force, (1966), The Chanign World of Scholarly Communication Challenges and Choice for Canda, November 1966[on-line:<http://www.acucc.ca/english/sites/auccarl.htm>]

Bailey, Charles W., Jr. (1994), "Scholarly Electronic Publishing on the Internet, the NREN, and the NII: Charting Possible Futures." *Serials Review* 20, no. 3 (1994): 7-16. HTML file: <URL:<http://info.lib.uh.edu/cwb/schpub.htm>>. ASCII file: <URL:<http://info.lib.uh.edu/cwb/schpub.txt>>.

Bailey, Charles W., Jr., and Dana Rooks, eds. (1991), "Symposium on the Role of Network-Based Electronic Resources in Scholarly Communication and Research." *The Public-Access Computer Systems Review* 2, no. 2 (1991): 4-60. ASCII file: <URL:<http://info.lib.uh.edu/pr/v2/n2/bailey1.2n2>>.

Berge, Z. and Collins, M., (1993), The Founding and Managing of IPCT-L: A listowners' Perspective (Note 1). [<http://www.helsinki.fi/science/optek/1993/n2/berge.txt>] IPCT 1(2)

Brent, D. (1995), "Stevan Harnad's 'Subversive Proposal': Kick-Starting Electronic Scholarship." *EJournal* 5, no. 1, HTML file:
<URL:<http://rachel.albany.edu/~ejournal/v5n1/article.html>>.

Burke, Edmund B. (1996), "They Can't Say That, Can They?" *EDUCOM Review* 31 (July/August 1996): 12-13. HTML file: <URL:
<http://www.educom.edu/web/pubs/review/reviewArticles/31412.html> >.

Butler, H. Julene. (1994) The Electronic Journal: A Viable Channel for Formal Scholarly Communication? Proceedings of the ASIS Mid-Year Meeting. : 58-70.

Clews, John, (1997), "Digital Language Access: Scripts, Transliteration, and Computer Access." *D-Lib Magazine* (March 1997). HTML file:
<URL:<http://www.dlib.org/dlib/march97/sesame/03clews.html>>.

Crawford, S. and Stucki, L. (1990), Peer Review and the Changing Research Record. *Journal of the American Society for Information Science.* ; 41(3).223-28

Day, Colin.(1994), "The Economics of Electronic Publishing: Some Preliminary Thoughts." In *Gateways, Gatekeepers, and Roles in the Information Omniverse: Proceedings of the Third Symposium*, eds. Ann Okerson and Dru Mogge, 77-84. Washington, DC: Office of Scientific and Academic Publishing, Association of Research Libraries, 1994. HTML file:
<URL:<http://arl.cni.org/symp3/day.html>>.

Day, Michael. (1997), *Preservation of Electronic Information: A Bibliography*. Bath: UK Office for Library and Information Networking, 1997. HTML file:
<URL:<http://www.ukoln.ac.uk/~lismd/preservation.html>>.

Denning, Peter J., and Bernard Rous. (1995), "The ACM Electronic Publishing Plan." *Communications of the ACM* 38 (April 1995): 97-109. HTML file:
<URL:http://info.acm.org/pubs/epub_plan.html>.

Doane, Andrea. (1996), "The ARTFL Project: An Introduction." *D-Lib Magazine* (January 1996). HTML file: <URL:<http://www.dlib.org/dlib/january96/briefings/01artfl.html>>.
ARTFL Project: <URL:<http://humanities.uchicago.edu/ARTFL/ARTFL.html>>.

Dyson, Esther. (1995), "Intellectual Value." *Wired* 3 (July 1995): 136-141, 182-184. HTML file: <URL:<http://www.hotwired.com/wired/3.07/features/dyson.html>>.

Fenske, David E., and Jon W. Dunn. (1996), "The VARIATIONS Project at Indiana University's Music Library." *D-Lib Magazine* (June 1996). HTML file:
<URL:<http://www.dlib.org/dlib/june96/variations/06fenske.html>>.

Garfield, E. (1990), Response to the Panel on Evaluation of Scientific Information and the Impact of New Information Technology. *Journal of the American Society for Information Science.* ; 41(3).229-30

Ginsparg, P. (1994) First steps towards electronic research communication, *Computers in Physics* 8(4), 390-396

Gresham, J., (1994), From Invisible College to Cyberspace College: Computer Conferencing and the Transformato of Informal Scholarly COmmunication Networks, [on-line: <http://infix.emp.paed.uni-muenchen.de/nic/materiale/ipct/gresham.txt>] IPCT 2(4)

Harloe, Bart; Budd, John M. (1994) Collection Development and Scholarly Communication in the Era of Electronic Access. *Journal of Academic Librarianship*. May; 20(2): 83-87; ISSN: 0099-1333.

Herzog, Kate. (1990) Collection Development for the Electronic Library. *Computers in Libraries*. Nov; 10(10): 9-13.

Hibbits, B., (1997), Last Writes? Re-assessing the Law Review in the Afgw od Cyberspace version 1.2 March 1997 [<http://www.law.pitt.edu/hibbits/lsatrev.htm>]

Langston, Lizbeth. (1996), "Scholarly Communication and Electronic Publication: Implications for Research, Advancement, and Promotion." In *Untangling the Web: Proceedings of the Conference Sponsored by the Librarians Association of the University of California, Santa Barbara and Friends of the UCSB Library*, ed. Andrea L. Duda. Santa Barbara: University of California, Santa Barbara Library. HTML file: <URL:<http://www.library.ucsb.edu/untangle/langston.html>>.

Leckie, Gloria J. (1996) Desperately Seeking Citations: Uncovering Faculty Assumptions about the Undergraduate Research Process. *Journal of Academic Librarianship*. May; 22(3): 201-08; ISSN: 0099-1333.

Lunin, L. and Crawford, S. (1990), Evaluation of Scientific Information: Peer Review and the Impact of New Information Technology. *Journal of the American Society for Information Science*. ; 41(3).214-5

Magrill, Rose Mary. (1984) Publishing of Research in Librarianship. *Library Trends*. Mar; 32(4): 557-77.

Okerson, Ann (), Ownership or Access? New Models for the Electronic Era, [on-line : <http://www.sfu.ca/~scom/paper-okerson.html> (undated)]

Okerson, Ann. (), "Oh Lord, Won't You Buy Me a Mercedes Benz. Or, There is a There There." *Surfaces* (1994). ASCII file: <URL:<http://www.nlc-bnc.ca/eppp-archive/surfaces/volume4/a-okerso.txt>>.

Okerson, Ann. (1991), "The Electronic Journal: What, Whence, and When?" *The Public-Access Computer Systems Review* 2, no. 1: 5-24. ASCII file: <URL:<http://info.lib.uh.edu/pr/v2/n1/okerson.2n1>>.

Rowland, Fytton. (1994), "Electronic Journals: Neither Free Nor Easy." *EJournal* 4, no. 2. HTML file: <URL:<http://rachel.albany.edu/~ejournal/v4n2/article2.html>>.

Schaffner, Ann C. (1994) The Future of Scientific Journals: Lessons from the Past. *Information Technology and Libraries*. Dec; 13(4): 239-47; ISSN: 0730-9295.

Shires, Nancy P. (1992) Computer-Mediated Lists for Foreign Languages. *Foreign Language Annals*. Dec; 25(6): 533-39; ISSN: 0015-718X.

StClair, G.; Thatcher, S. G. (1997) Changing Copyright Legislation: Two Views. *Library Acquisitions-Practice And Theory*. ; 21(1): 7-18; ISSN: 0364-6408.

Stephen, Timothy; Harrison, Teresa M. (1994) Comserve: Moving the Communication Discipline Online. *Journal of the American Society for Information Science*. Dec; 45(10): 765-70; ISSN: 0002-8231.

Trant, Jennifer. (1997), "Images on the Internet: Issues and Opportunities." *American Council of Learned Societies Newsletter* 4 (February 1997). HTML file: <URL:<http://www.acls.org/n44trant.htm>>.

Tulip Final Report. (1996), New York: Elsevier Science. HTML file: <URL:<http://www.elsevier.nl:80/homepage/about/resproj/trmenu.htm>>.

Weedman, Judith. (1994) Humanist and Scholarly Communication. *Proceedings of the ASIS Mid-Year Meeting*, 184-95. : 'Navigating the Networks,' Portland, OR, May 21-25, 1994.

Weibel, Stuart, and Eric Miller. (1997), "Image Description on the Internet: A Summary of the CNI/OCLC Image Metadata Workshop, September 24-25, 1996, Dublin Ohio." *D-Lib Magazine* (January 1997). HTML file: <URL:<http://www.dlib.org/dlib/january97/oclc/01weibel.html>>.

Wilson, David L. (1991) Testing Time for Electronic Journals. *Chronicle of Higher Education*. Sep 11; 38(3): A22-24; ISSN: 0009-5982.

7.3.3 Bibliographic References for Indirect Citations

Amman C. and Knorr-Cetina K. (1988) Thinking through talk: an Ethnographic Study of a Molecular Biology Laboratory. Paper presented at: 1988 A Symposium on Science Communication: Environmental and Health Research; 1988 December 15-17; Los Angeles, CA 41p

Biglan, A., (1973) The characteristics of subject matter in different scientific areas journal of applied sociology 57 pp 195-203

Frank Quinn: (1994) A Role for Libraries in Electronic Publication, EJournal, 4(2)
:http://rachel.albany.edu/~ejournal/v4n2/article.html

Kolb, D.A., (1981) Learning styles and disciplinary differences in A Chickering (Ed) The Modern American College, San Francisco, CA, Jossey Bass

Park, Taemin Kim, The nature of relevance in information retrieval, an empirical study, Library Quarterly 63, July 1993, 318-51